

HP Integrity NonStop BladeSystem Planning Guide



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About This Document

This guide describes the HP Integrity NonStop™ BladeSystem and provides examples of system configurations to assist you in planning for installation of a new HP Integrity NonStop™ NB50000c BladeSystem.

Supported Release Version Updates (RVUs)

This publication supports J06.03 and all subsequent J-series RVUs until otherwise indicated in a replacement publication.

Intended Audience

This guide is written for those responsible for planning the installation, configuration, and maintenance of a NonStop BladeSystem and the software environment at a particular site. Appropriate personnel must have completed HP training courses on system support for NonStop BladeSystems.

New and Changed Information in This Edition

This is a new manual.

Document Organization

Section	Contents
Chapter 1 (page 15)	This chapter provides an overview of the Integrity NonStop NB50000c BladeSystem.
Chapter 2 (page 31)	This chapter outlines topics to consider when planning or upgrading the installation site.
Chapter 3 (page 37)	This chapter provides the installation specifications for a fully populated NonStop BladeSystem enclosure.
Chapter 4 (page 53)	This chapter describes the guidelines for implementing the NonStop BladeSystem.
Chapter 5 (page 77)	This chapter shows recommended locations for hardware enclosures in the NonStop BladeSystem.
Chapter 6 (page 81)	This chapter describes the connectivity options, including ISEE, for maintenance and support of a NonStop BladeSystem.
Appendix A (page 93)	This appendix identifies the cables used with the NonStop BladeSystem hardware.
Appendix B (page 95)	This appendix describes how to use the OSM applications to manage a NonStop BladeSystem.
Appendix C (page 99)	This appendix describes the default startup characteristics for a NonStop BladeSystem.

Notation Conventions

General Syntax Notation

This list summarizes the notation conventions for syntax presentation in this manual.

UPPERCASE LETTERS	<p>Uppercase letters indicate keywords and reserved words. Type these items exactly as shown. Items not enclosed in brackets are required. For example: MAXATTACH</p>
<i>Italic Letters</i>	<p>Italic letters, regardless of font, indicate variable items that you supply. Items not enclosed in brackets are required. For example: <i>file-name</i></p>
Computer Type	<p>Computer type letters indicate:</p> <ul style="list-style-type: none"> • C and Open System Services (OSS) keywords, commands, and reserved words. Type these items exactly as shown. Items not enclosed in brackets are required. For example: Use the <code>cextdecs.h</code> header file. • Text displayed by the computer. For example: Last Logon: 14 May 2006, 08:02:23 • A listing of computer code. For example <pre>if (listen(sock, 1) < 0) { perror("Listen Error"); exit(-1); }</pre>
Bold Text	<p>Bold text in an example indicates user input typed at the terminal. For example:</p> <pre>ENTER RUN CODE ?123 CODE RECEIVED: 123.00</pre> <p>The user must press the Return key after typing the input.</p>
[] Brackets	<p>Brackets enclose optional syntax items. For example:</p> <pre>TERM [\system-name.]\$terminal-name INT[ERRUPTS]</pre> <p>A group of items enclosed in brackets is a list from which you can choose one item or none. The items in the list can be arranged either vertically, with aligned brackets on each side of the list, or horizontally, enclosed in a pair of brackets and separated by vertical lines. For example:</p> <pre>FC [num] [-num] [text] K [X D] address</pre>
{ } Braces	<p>A group of items enclosed in braces is a list from which you are required to choose one item. The items in the list can be arranged either vertically, with aligned braces on each side of the list, or horizontally, enclosed in a pair of braces and separated by vertical lines. For example:</p> <pre>LISTOPENS PROCESS { \$appl-mgr-name } { \$process-name } ALLOWSU { ON OFF }</pre>

Vertical Line	<p>A vertical line separates alternatives in a horizontal list that is enclosed in brackets or braces. For example:</p> <pre>INSPECT { OFF ON SAVEABEND }</pre>
... Ellipsis	<p>An ellipsis immediately following a pair of brackets or braces indicates that you can repeat the enclosed sequence of syntax items any number of times. For example:</p> <pre>M address [, new-value]... -] {0 1 2 3 4 5 6 7 8 9}...</pre> <p>An ellipsis immediately following a single syntax item indicates that you can repeat that syntax item any number of times. For example:</p> <pre>"s-char..."</pre>
Punctuation	<p>Parentheses, commas, semicolons, and other symbols not previously described must be typed as shown. For example:</p> <pre>error := NEXTFILENAME (file-name) ; LISTOPENS SU \$process-name.#su-name</pre> <p>Quotation marks around a symbol such as a bracket or brace indicate the symbol is a required character that you must type as shown. For example:</p> <pre>"[" repetition-constant-list "]"</pre>
Item Spacing	<p>Spaces shown between items are required unless one of the items is a punctuation symbol such as a parenthesis or a comma. For example:</p> <pre>CALL STEPMOM (process-id) ;</pre> <p>If there is no space between two items, spaces are not permitted. In this example, no spaces are permitted between the period and any other items:</p> <pre>\$process-name.#su-name</pre>
Line Spacing	<p>If the syntax of a command is too long to fit on a single line, each continuation line is indented three spaces and is separated from the preceding line by a blank line. This spacing distinguishes items in a continuation line from items in a vertical list of selections. For example:</p> <pre>ALTER [/ OUT file-spec /] LINE [, attribute-spec]...</pre>

Publishing History

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545740-002	N.A.	May 2008

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1 NonStop BladeSystem Overview



NOTE: This document describes products and features that are not yet available on systems running J-series RVUs. These products and features include:

- CLuster I/O Modules (CLIMs)
- The Cluster I/O Protocols (CIP) subsystem
- Serial attached SCSI (SAS) disk drives and their enclosures

The Integrity NonStop BladeSystem provides an integrated infrastructure with consolidated server, network, storage, power, and management capabilities. The NonStop BladeSystem implements the BladeSystem c-Class architecture and is optimized for enterprise data center applications. The NonStop NB50000c BladeSystem is introduced as part of the J06.03 RVU.

NonStop NB50000c BladeSystem

The NonStop NB50000c BladeSystem combines the NonStop operating system and HP Integrity NonStop BL860c Server Blades in a single footprint as part of the “NonStop Multicore Architecture (NSMA)” (page 16).

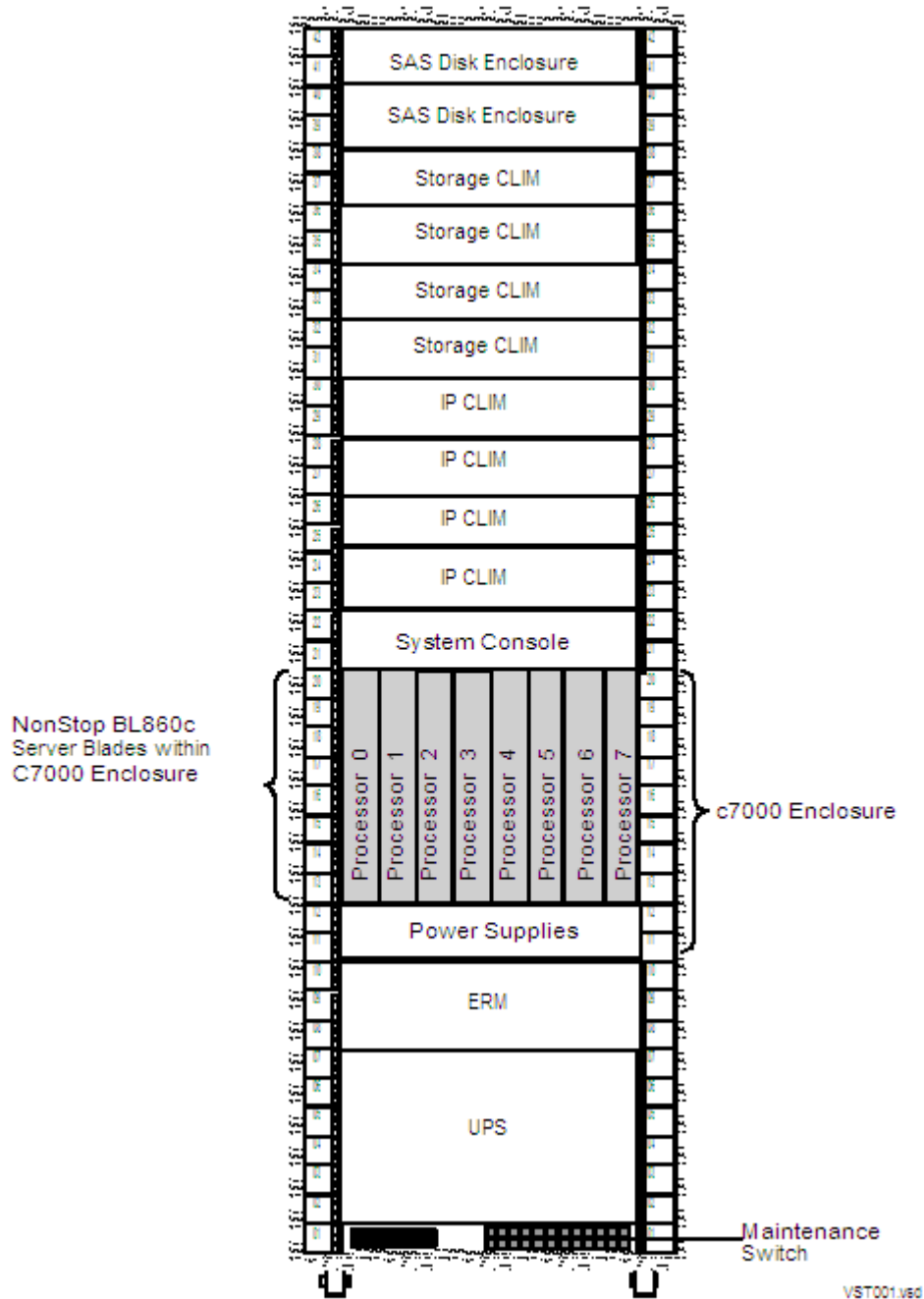
The characteristics of an Integrity NonStop NB50000c BladeSystem are:

Processor	Intel Itanium
Processor model	NSE-M
Chassis	c7000 enclosure (one enclosure for 2 to 8 processors; two enclosures for 10 to 16 processors)
Cabinet	42U, 19 inch rack
Minimum/maximum main memory per logical processor	8 GB to 48 GB
Minimum/maximum processors	2 to 16
Supported processor configurations	2, 4, 6, 8, 10, 12, 14, or 16
Maximum CLuster I/O Modules (CLIMs) in a NonStop Blade System with 16 processors	24 CLIMs (IP and Storage)
Minimum CLIMs	<ul style="list-style-type: none">• 0 CLIMs (if there are IOAM enclosures)• 2 Storage CLIMs and 2 IP CLIMs (if there are no IOAM enclosures)
Maximum SAS disk enclosures per Storage CLIM pair	4
Maximum SAS disk drives per Storage CLIM pair	100
Maximum Fibre Channel disk modules (FCDMs) through IOAM enclosure	4 FCDMs daisy-chained with 14 disk drives in each FCDM
Maximum IOAM enclosures ¹	<ul style="list-style-type: none">• 6 IOAMs for 10 to 16 processors• 4 IOAMs for 2 to 8 processors
Enterprise Storage System (ESS) support available through Storage CLIMs or IOAM enclosures	Supported
Connection to NonStop ServerNet Clusters	Supported
M8201R Fibre Channel to SCSI router support	Not supported
Connection to NonStop S-series I/O	Not supported

¹ When CLIMs are also included in the configuration, the maximum number of IOAMs might be smaller. Check with your HP representative to determine your system's maximum for IOAMs.

Figure 1-1 “Example of a NonStop NB50000c BladeSystem” shows the front view of an example NonStop NB50000c BladeSystem with eight server blades in a 42U modular cabinet with the optional HP R12000/3 UPS and the HP AF434A extended runtime module (ERM).

Figure 1-1 Example of a NonStop NB50000c BladeSystem



NonStop Multicore Architecture (NSMA)

The NonStop BladeSystem employs the HP NonStop Multicore Architecture (NSMA) to achieve full software fault tolerance by running the NonStop operating system on NonStop Server Blades. With the NSMA's multiple core microprocessor architecture, a set of cores comprised of instruction processing units (IPUs) share the same memory map (except in low-level software). The NSMA extends the traditional NonStop logical processor to a multiprocessor and includes:

- No hardware lockstep checking
- Itanium fault detection

- High-end scalability
- Application virtualization
- Cluster programming transparency

The NonStop NB50000c BladeSystem can be configured with 2 to 16 processors, communicates with other NonStop BladeSystems using Expand, and achieves ServerNet connectivity using a ServerNet mezzanine, PCI Express (PCIe) interface card installed in the server blade.

NonStop NB50000c BladeSystem Hardware

A large number of enclosure combinations is possible within the modular cabinets of a NonStop NB50000c BladeSystem. The applications and purpose of any NonStop BladeSystem determine the number and combinations of hardware within the cabinet.

Standard hardware for a NonStop BladeSystem includes:

- “c7000 Enclosure”
- “NonStop Server Blade” (page 19)
- “Storage CLuster I/O Module (CLIM)” (page 19)
- “SAS Disk Enclosure ” (page 20)
- “IP CLuster I/O Module (CLIM)” (page 19)
- “IOAM Enclosure” (page 20)
- “Fibre Channel Disk Module (FCDM)” (page 20)
- “Maintenance Switch” (page 20)
- “System Console” (page 21)

Optional Hardware for a NonStop BladeSystem includes:

- “UPS and ERM (Optional)” (page 21)
- “Enterprise Storage System (Optional)” (page 22)
- “Tape Drive and Interface Hardware (Optional)” (page 23)

All NonStop BladeSystem components are field-replaceable units that can only be serviced by service providers trained by HP.

Because of the number of possible configurations, you can calculate the total power consumption, heat dissipation, and weight of each modular cabinet based on the hardware configuration that you order from HP. For site preparation specifications for the modular cabinets and the individual enclosures, see Chapter 3 (page 37).

c7000 Enclosure

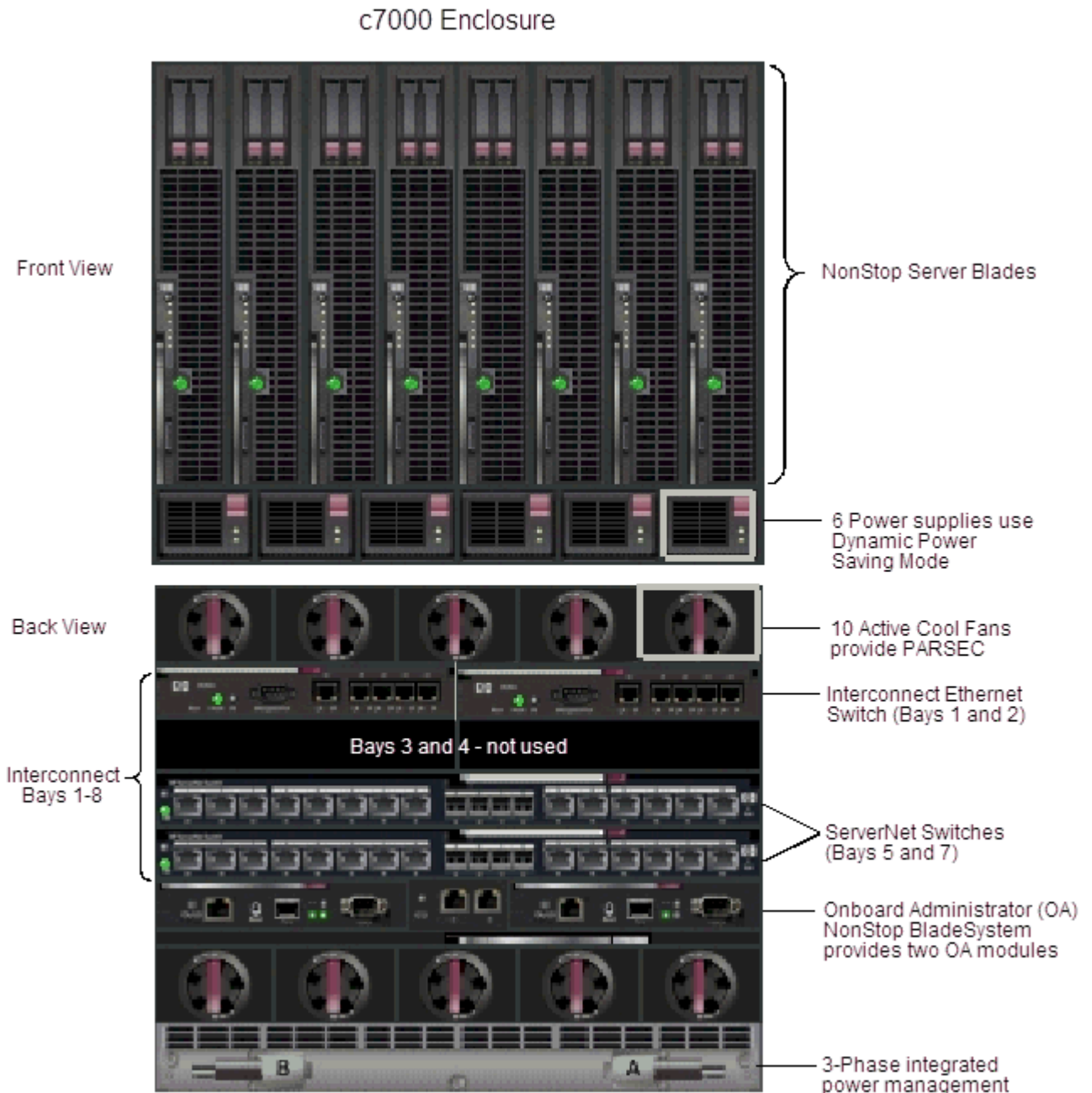
The three-phase c7000 enclosure provides integrated processing, power, and cooling capabilities along with connections to the I/O infrastructure. The c7000 enclosure features include:

- Up to 8 NonStop Server Blades per c7000 enclosure – populated in pairs
- Two Onboard Administrator (OA) management modules that provide detection, identification, management, and control services for the NonStop BladeSystem.
- The HP Insight Display provides information about the health and operation of the enclosure. For more information about the HP Insight Display, which is the visual interface located at the bottom front of the OA, see the *HP BladeSystem Onboard Administrator User Guide*.
- Two Interconnect Ethernet switches that download Halted State Services (HSS) bootcode via the maintenance LAN.
- Two ServerNet switches that provide ServerNet connectivity between processors, between processors and I/O, and between systems (through connections to cluster switches). There are two types of ServerNet switches: Standard I/O or High I/O.

- Six power supplies that implement Dynamic Power Saving Mode. This mode is enabled by the OA module, and when enabled, monitors the total power consumed by the c7000 enclosure in real-time and automatically adjusts to changes in power demand.
- Ten Active Cool fans use the parallel, redundant, scalable, enclosure-based cooling (PARSEC) architecture where fresh, cool air flows over all the blades (in the front of the enclosure) and all the interconnect modules (in the back of the enclosure).

Figure 1-2 shows all of these c7000 features, except the HP Insight Display:

Figure 1-2 c7000 Enclosure Features



VST730.v6d

For information about the LEDs associated with the c7000 enclosure components, see the *HP BladeSystem c7000 Enclosure Setup and Installation Guide*.

NonStop Server Blade

The NonStop BL860c Server Blade is a two socket full-height server blade featuring an Intel® Itanium® dual-core processor. Each server blade contains a ServerNet interface mezzanine card with PCI-Express x4 to PCI-x bridge connections to provide ServerNet fabric connectivity. Other features include four integrated Gigabit Ethernet ports for redundant network boot paths and 12 DIMM slots providing a maximum of 48 GB of memory per server blade.

IP Cluster I/O Module (CLIM)

The IP CLIM is a rack-mounted server that is part of some NonStop BladeSystem configurations. The IP CLIM functions as a ServerNet Ethernet adapter providing HP standard Gigabit Ethernet Network Interface Cards (NICs) to implement one of the IP CLIM configurations (either IP CLIM A or IP CLIM B):

IP CLIM A Configuration (5 Copper Ports)

- Slot 1 contains a NIC that provides four copper Ethernet ports
- Eth01 port (between slots 1 and 2) provides one copper Ethernet port
- Slot 3 contains a ServerNet PCIe interface card, which provides the ServerNet fabric connections

IP CLIM B Configuration (3 Copper/2 Fiber Ports)

- Slot 1 contains a NIC that provides three copper Ethernet ports
- Slot 2 contains a NIC that provides one fiber-optical Ethernet port
- Slot 3 contains a ServerNet interface PCIe card, which provides the ServerNet fabric connections
- Slot 4 contains a NIC that provides one fiber-optical Ethernet port

For an illustration of the IP CLIM slots, see “Ethernet to Networks” (page 70).



NOTE: Both the IP and Storage CLIMs use the Cluster I/O Protocols (CIP) subsystem. For more information about the CIP subsystem, see the *Cluster I/O Protocols Configuration and Management Manual*.

Storage Cluster I/O Module (CLIM)

The Storage CLuster I/O Module (CLIM) is part of some NonStop BladeSystem configurations. The Storage CLIM is a rack-mounted server and functions as a ServerNet I/O adapter providing:

- Dual ServerNet fabric connections
- A Serial Attached SCSI (SAS) interface for the storage subsystem via a SAS Host Bus Adapter (HBA) supporting SAS disk drives and SAS tapes
- A Fibre Channel (FC) interface for ESS and FC tape devices via a customer-ordered FC HBA. A Storage CLIM can have 0, 2, or 4 FC ports.

The Storage CLIM contains 5 PCIe HBA slots with these characteristics:

Storage CLIM HBA Slot	Configuration	Provides
5	Part of base configuration	One SAS external and internal connector with four SAS links per connector and 3 Gbps per link is provided by the PCIe 8x slot.
4	Part of base configuration	One SAS external connector with four SAS links per connector and 3 Gbps per link is provided by the PCIe 8x slot.
3	Part of base configuration	ServerNet fabric connections via a PCIe 4x adapter.

Storage CLIM HBA Slot	Configuration	Provides
2	Optional customer order	SAS or Fibre Channel
1	Optional customer order	SAS or Fibre Channel

Connections to FCDMs are not supported.

For an illustration of the Storage CLIM HBA slots, see “Storage CLIM Devices” (page 57).

SAS Disk Enclosure

The SAS disk enclosure is a rack-mounted disk enclosure and is part of some NonStop BladeSystem configurations. The SAS disk enclosure supports up to 25 SAS disk drives, 3Gbps SAS protocol, and a dual SAS domain from Storage CLIMs to dual port SAS disk drives. The SAS disk enclosure supports connections to SAS disk drives. Connections to FCDMs are not supported. For more information about the SAS disk enclosure, see the manual for your SAS disk enclosure model (for example, the *HP StorageWorks 70 Modular Smart Array Enclosure Maintenance and Service Guide*).

The SAS disk enclosure contains:

- 25, 2.5” disk drive slots with size options:
 - 72GB, 15K rpm
 - 146GB, 10K rpm
- Two independent I/O modules:
 - SAS Domain A
 - SAS Domain B
- Two fans
- Two power supplies

IOAM Enclosure

The IOAM enclosure is part of some NonStop BladeSystem configurations. The IOAM enclosure uses Gigabit Ethernet 4-port ServerNet adapters (G4SAs) for networking connectivity and Fibre Channel ServerNet adapters (FCSAs) for Fibre Channel connectivity between the system and Fibre Channel disk modules (FCDMs), ESS, and Fibre Channel tape.

Fibre Channel Disk Module (FCDM)

The Fibre Channel disk module (FCDM) is a rack-mounted enclosure that can only be used with NonStop BladeSystems that have IOAM enclosures. The FCDM connects to to an FCSA in an IOAM enclosure and contains:

- Up to 14 Fibre Channel arbitrated loop disk drives (enclosure front)
- Environmental monitoring unit (EMU) (enclosure rear)
- Two fans and two power supplies
- Fibre Channel arbitrated loop (FC-AL) modules (enclosure rear)

You can daisy-chain together up to four FCDMs with 14 drives in each one.

Maintenance Switch

The HP ProCurve 2524 maintenance switch provides the communication between the NonStop BladeSystem through the Onboard Administrator, c7000 enclosure interconnect Ethernet switch, Storage and IP CLIMs, IOAM enclosures, the optional UPS, and the system console running HP NonStop Open System Management (OSM). For a general description of the maintenance switch, refer to the *NonStop NS14000 Planning Guide*. Details about the use or implementation of the maintenance switch that are specific to a NonStop BladeSystem are presented here.

The NonStop BladeSystem requires multiple connections to the maintenance switch. The following describes the required connections for each hardware component.

BladeSystem Connections to Maintenance Switch

- One connection per Onboard Administrator on the NonStop BladeSystem
- One connection per Interconnect Ethernet switch on the NonStop BladeSystem
- One connection to the optional UPS module
- One connection for the system console running OSM

CLIM Connections to Maintenance Switch

- One connection to the iLO port on a CLIM
- One connection to an eth0 port on a CLIM

IOAM Enclosure Connections to Maintenance Switch

- One connection to each of the two ServerNet switch boards in one I/O adapter module (IOAM) enclosure.
- At least two connections to any two Gigabit Ethernet 4-port ServerNet adapters (G4SAs), if the NonStop BladeSystem maintenance LAN is implemented through G4SAs.

System Console

A system console is a personal computer (PC) purchased from HP that runs maintenance and diagnostic software for NonStop BladeSystems. When supplied with a new NonStop BladeSystem, system consoles have factory-installed HP and third-party software for managing the system. You can install software upgrades from the HP NonStop System Console Installer DVD image.

Some system console hardware, including the PC system unit, monitor, and keyboard, can be mounted in the NonStop BladeSystem's 19-inch rack. Other PCs are installed outside the rack and require separate provisions or furniture to hold the PC hardware.

For more information on the system console, refer to “System Consoles” (page 89).

UPS and ERM (Optional)

An uninterruptible power supply (UPS) is optional but recommended where a site UPS is not available. HP supports the HP model R12000/3 UPS because it utilizes the power fail support provided by the OSM. For information about the requirements for installing a UPS, see “Uninterruptible Power Supply (UPS)” (page 32).

There are two different versions of the R12000/3 UPS:

- For North America and Japan, the HP AF429A is utilized and uses an IEC309 560P9 (60A) input connector with 208V three phase (120V phase-to-neutral)
- For International, the HP AF430A is utilized and uses an IEC309 532P6 (32A) input connector with 400V three phase (230V phase-to-neutral).

Cabinet configurations that include the HP UPS can also include extended runtime modules (ERMs). An ERM is a battery module that extends the overall battery-supported system run time.

Up to four ERMs can be used for even longer battery-supported system run time. HP supports the HP AF434A ERM.



WARNING! UPS's and ERMs must be mounted in the lowest portion of the NonStop BladeSystem to avoid tipping and stability issues.



NOTE: The R12000/3 UPS has two output connectors. For I/O racks, only the output connector to the rack level PDU is used. For processor racks, one output connector goes to the c7000 chassis and the other to the rack PDU. For power feed setup instructions, see “NonStop BladeSystem Power Distribution” (page 37) and “Power Feed Setup for the NonStop BladeSystem” (page 38).

For the R12000/3 UPS power and environmental requirements, refer to Chapter 3 (page 37). For planning, installation, and emergency power-off (EPO) instructions, refer to the *HP 3 Phase UPS User Guide*. This guide is available at:

<http://bizsupport.austin.hp.com/bc/docs/support/SupportManual/c01079392/c01079392.pdf>

For other UPS's, refer to the documentation shipped with the UPS.

Enterprise Storage System (Optional)

An Enterprise Storage System (ESS) is a collection of magnetic disks, their controllers, and a disk cache in one or more standalone cabinets. ESS connects to the NonStop BladeSystem via the Storage CLIM's Fibre Channel HBA ports (direct connect), Fibre Channel ports on the IOAM enclosures (direct connect), or through a separate storage area network (SAN) using a Fibre Channel SAN switch (switched connect). For more information about these connection types, see your service provider.



NOTE: The Fibre Channel SAN switch power cords might not be compatible with the modular cabinet PDU. Contact your service provider to order replacement power cords for the SAN switch that are compatible with the modular cabinet PDU.

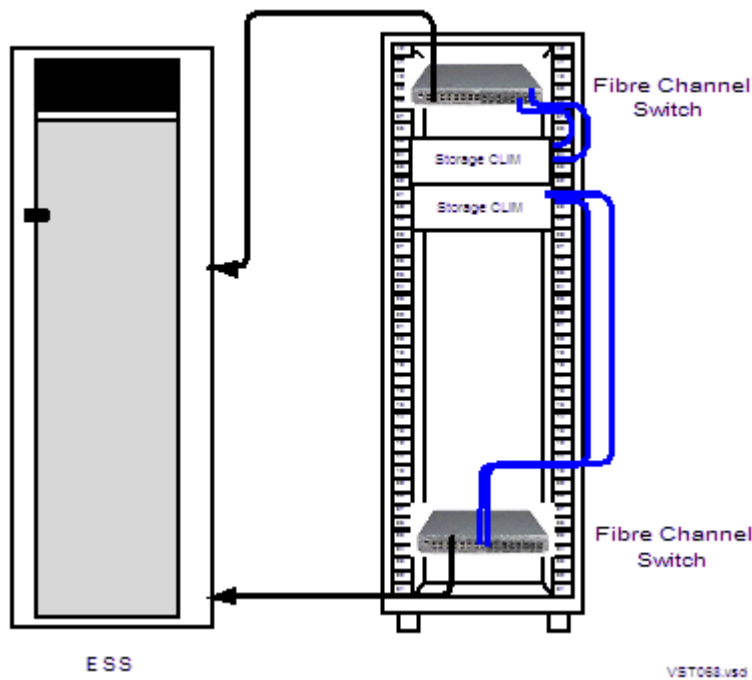
Cables and switches vary, depending on whether the connection is direct, switched, or a combination:

Connection	Cables	Fibre Channel Switches
Direct connect	2 Fibre Channel ports on IOAM (LC-LC)	0
	2 Fibre Channel HBA ports on Storage CLIM (LC-MMF) ¹	0
Switched	4 Fibre Channel ports (LC-LC)	1 or more
	4 Fibre Channel HBA ports on Storage CLIM (LC-MMF)	1 or more
Combination of direct and switched	2 Fibre Channel ports for each direct connection	1
	4 Fibre Channel ports for each switched connection	1

¹ Customer must order the FC HBA ports on the Storage CLIM.

Figure 1-3 shows an example of connections between two Storage CLIMs and an ESS via separate Fibre Channel switches:

Figure 1-3 Connections Between Storage CLIMs and ESS



For fault tolerance, the primary and backup paths to an ESS logical device (LDEV) must go through different Fibre Channel switches.

Some storage area procedures, such as reconfiguration, can cause the affected switches to pause. If the pause is long enough, I/O failure occurs on all paths connected to that switch. If both the primary and the backup paths are connected to the same switch, the LDEV goes down.

Refer to the documentation that accompanies the ESS.

Tape Drive and Interface Hardware (Optional)

For an overview of tape drives and the interface hardware, see “Fibre Channel Ports to Fibre Tape Devices” (page 57) or “SAS Ports to SAS Tape Devices” (page 57).

For a list of supported tape devices, ask your service provider to refer to the *NonStop BladeSystem Hardware Installation Manual*.

Preparation for Other Server Hardware

This guide provides the specifications only for the NonStop BladeSystem modular cabinets and enclosures identified earlier in this section. For site preparation specifications for other HP hardware that will be installed with the NonStop BladeSystems, consult your HP account team. For site preparation specifications relating to hardware from other manufacturers, refer to the documentation for those devices.

Management Tools for NonStop BladeSystems



NOTE: For information about changing the default passwords for NonStop BladeSystem components and associated software, see “Changing Customer Passwords” (page 71).

This subsection describes the management tools available on your NonStop BladeSystem:

- “OSM Package” (page 24)
- “Onboard Administrator (OA)” (page 24)
- “Integrated Lights Out (iLO)” (page 24)

- “Cluster I/O Protocols (CIP) Subsystem” (page 24)
- “Subsystem Control Facility (SCF) Subsystem” (page 24)

OSM Package

The HP Open System Management (OSM) product is the required system management tool for NonStop BladeSystems. OSM works together with the Onboard Administrator (OA) and Integrated Lights Out (iLO) management interfaces to manage c7000 enclosures. A new client-based component, the OSM Certificate Tool, facilitates communication between OSM and the OA.

For more information on the OSM package, including a description of the individual applications see the *OSM Migration and Configuration Guide* and the *OSM Service Connection User’s Guide*.

Onboard Administrator (OA)

The Onboard Administrator (OA) is the enclosure's management, processor, subsystem, and firmware base and supports the c7000 enclosure and NonStop Server Blades. The OA software is integrated with OSM and the Integrated Lights Out (iLO) management interface.

Integrated Lights Out (iLO)

iLO allows you to perform activities on the NonStop Bladesystem from a remote location and provides anytime access to system management information such as hardware health, event logs and configuration is available to troubleshoot and maintain the NonStop Server Blades.

Cluster I/O Protocols (CIP) Subsystem

The Cluster I/O Protocols (CIP) subsystem provides a configuration and management interface for I/O on NonStop BladeSystems. The CIP subsystem has several tools for monitoring and managing the subsystem. For more information about these tools and the CIP subsystem, see the *Cluster I/O Protocols (CIP) Configuration and Management Manual*.

Subsystem Control Facility (SCF) Subsystem

The Subsystem Control Facility (SCF) also provides monitoring and management of the CIP subsystem on the NonStop BladeSystem. See the *Cluster I/O Protocols (CIP) Configuration and Management Manual* for more information about two subsystems with NonStop BladeSystems.

Component Location and Identification

This subsection includes these topics:

- “Terminology” (page 25)
- “Rack and Offset Physical Location” (page 26)
- “ServerNet Switch Group-Module-Slot Numbering” (page 26)
- “NonStop Server Blade Group-Module-Slot Numbering” (page 27)
- “CLIM Enclosure Group-Module-Slot-Port-Fiber Numbering” (page 27)
- “IOAM Enclosure Group-Module-Slot Numbering” (page 27)
- “Fibre Channel Disk Module Group-Module-Slot Numbering” (page 29)

Terminology

These are terms used in locating and describing components:

Term	Definition
Cabinet	Computer system housing that includes a structure of external panels, front and rear doors, internal racking, and dual PDUs.
Rack	Structure integrated into the cabinet into which rackmountable components are assembled. The rack uses this naming convention: <i>system-name-racknumber</i>
Rack Offset	The physical location of components installed in a modular cabinet, measured in U values numbered 1 to 42, with U1 at the bottom of the cabinet. A U is 1.75 inches (44 millimeters).
Group	A subset of a system that contains one or more modules. A group does not necessarily correspond to a single physical object, such as an enclosure.
Module	A subset of a group that is usually contained in an enclosure. A module contains one or more slots (or bays). A module can consist of components sharing a common interconnect, such as a backplane, or it can be a logical grouping of components performing a particular function.
Slot (or Bay or Position)	A subset of a module that is the logical or physical location of a component within that module.
Port	A connector to which a cable can be attached and which transmits and receives data.
Fiber	Number (one to four) of the fiber pair (LC connector) within an MTP-LC fiber cable. An MTP-LC fiber cable has a single MTP connector on one end and four LC connectors, each containing a pair of fibers, at the other end. The MTP connector connects to the ServerNet switch in the c7000 enclosure and the LC connectors connect to the CLIM
<ul style="list-style-type: none">• Group-Module-Slot (GMS)• Group-Module-Slot-Bay (GMSB)• Group-Module-Slot-Port (GMSP)• Group-Module-Slot-Port-Fiber (GMSPF)	A notation method used by hardware and software in NonStop systems for organizing and identifying the location of certain hardware components.
NonStop Server Blade	A server blade that provides processing and ServerNet connections.

On NonStop BladeSystems, locations of the modular components are identified by:

- Physical location:
 - Rack number
 - Rack offset
- Logical location: group, module, and slot (GMS) notation as defined by their position on the ServerNet rather than the physical location

OSM uses GMS notation in many places, including the Tree view and Attributes window, and it uses rack and offset information to create displays of the server and its components.

Rack and Offset Physical Location

Rack name and rack offset identify the physical location of components in a NonStop BladeSystem. The rack name is located on an external label affixed to the rack, which includes the system name plus a 2-digit rack number.

Rack offset is labeled on the rails in each side of the rack. These rails are measured vertically in units called **U**, with one U measuring 1.75 inches (44 millimeters). The rack is 42U with U1 located at the bottom and 42U at the top. The rack offset is the lowest number on the rack that the component occupies.

ServerNet Switch Group-Module-Slot Numbering

- Group (100-101):
 - Group 100 is the first c7000 processor enclosure containing logical processors 0-7.
 - Group 101 is the second c7000 processor enclosure containing logical processors 8-15.
- Module (2-3):
 - Module 2 is the X fabric.
 - Module 3 is the Y fabric.
- Slot (5 or 7):
 - Slot 5 contains the double-wide ServerNet switch for the X fabric.
 - Slot 7 contains the double-wide ServerNet switch for the Y fabric.



NOTE: There are two types of c7000 ServerNet switches: Standard I/O and High I/O. For more information and illustrations of the ServerNet switch ports, refer to “I/O Connections (Standard and High I/O ServerNet Switch Configurations)” (page 55).

- Port (1-18):
 - Ports 1 through 2 support the inter-enclosure links. Port 1 is marked GA. Port 2 is marked GB.
 - Ports 3 through 8 support the I/O links (IP CLIM, Storage CLIM, and IOAM)



NOTE: IOAMs must use Ports 4 through 7. These ports support 4-way IOAM links.

- Ports 9 and 10 support the cross links between two ServerNet switches in the same enclosure.
 - Ports 11 and 12 support the links to a cluster switch. SH on Port 11 stands for short haul. LH on Port 12 stands for long haul.
 - Ports 13 through 18 are not supported.
- Fiber (1-4)

These fibers support up to 4 ServerNet links on ports 3-8 of the c7000 enclosure ServerNet switch.

NonStop Server Blade Group-Module-Slot Numbering

These tables show the default numbering for the NonStop Server Blades of a NonStop BladeSystem when the server blades are powered on and functioning:

GMS Numbering For the Logical Processors:			
Processor ID	Group*	Module	Slot*
0	100	1	1
1	100	1	2
2	100	1	3
3	100	1	4
4	100	1	5
5	100	1	6
6	100	1	7
7	100	1	8
8	101	1	1
9	101	1	2
10	101	1	3
11	101	1	4
12	101	1	5
13	101	1	6
14	101	1	7
15	101	1	8

*In the OSM Service Connection, the term Enclosure is used for the group and the term Bay is used for the slot.

CLIM Enclosure Group-Module-Slot-Port-Fiber Numbering

This table shows the valid values for GMSPF numbering for the X1 ServerNet switch connection point to a CLIM:

	Group	Module	Slots	Ports	Fibers
ServerNet switch	100-101	2, 3	5, 7	3 to 8	1 - 4

IOAM Enclosure Group-Module-Slot Numbering

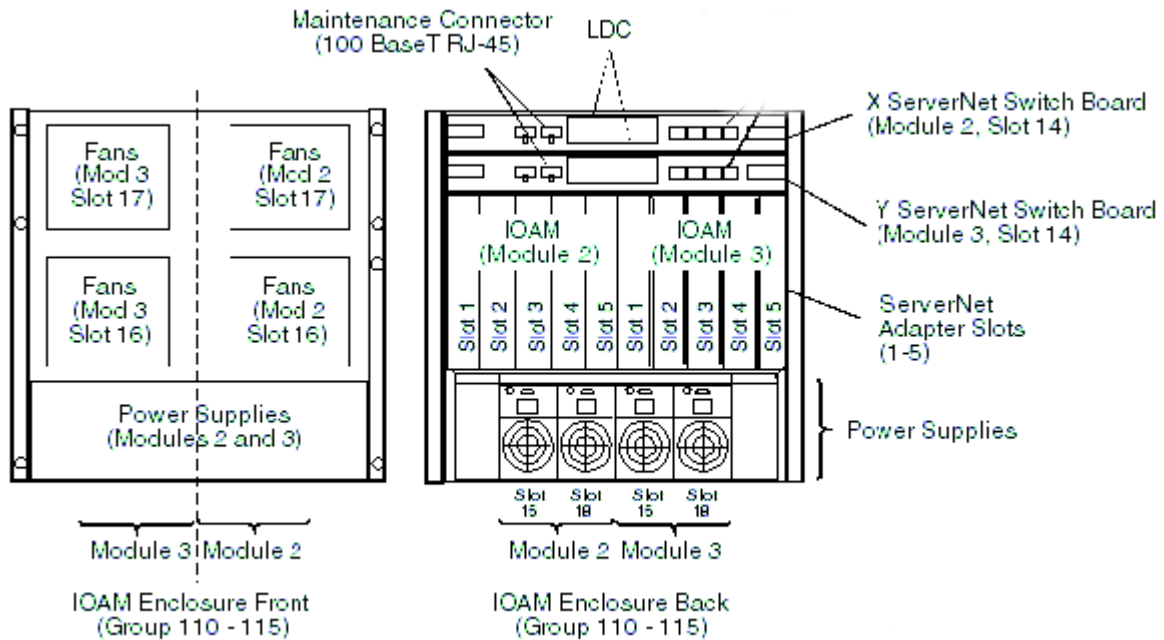
A NonStop BladeSystem supports IOAM enclosures, identified as group 110 through 115:

IOAM	Group	Module	Slot	Port	Fiber
110	100	2	5	4 (EA)	1 - 4
	100	3	7	4 (EA)	1 - 4
111	100	2	5	6 (EC)	1 - 4
	100	3	7	6 (EC)	1 - 4

IOAM	Group	Module	Slot	Port	Fiber
112	100	2	5	5 (EB)	1 - 4
	100	3	7	5 (EB)	1 - 4
113	100	2	5	7 (ED)	1 - 4
	100	3	7	7 (ED)	1 - 4
114	101	2	5	4 (EA)	1 - 4
	101	3	7	4 (EA)	1 - 4
115	101	2	5	6 (EC)	1 - 4
	101	3	7	6 (EC)	1 - 4

IOAM Group	X ServerNet Module	Y ServerNet Module	Slot	Item	Port
110 - 115 (See preceding table.)	2	3	1 to 5	ServerNet adapters	1 - n: where n is number of ports on adapter
			14	ServerNet switch logic board	1 - 4
			15, 18	Power supplies	-
			16, 17	Fans	-

This illustration shows the slot locations for the IOAM enclosure:



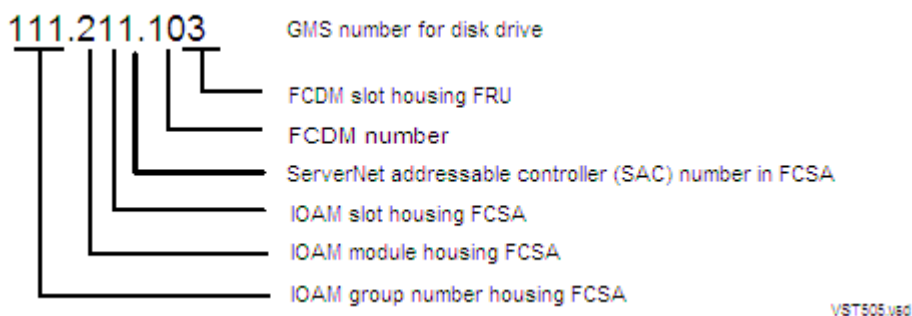
VST990.vsd

Fibre Channel Disk Module Group-Module-Slot Numbering

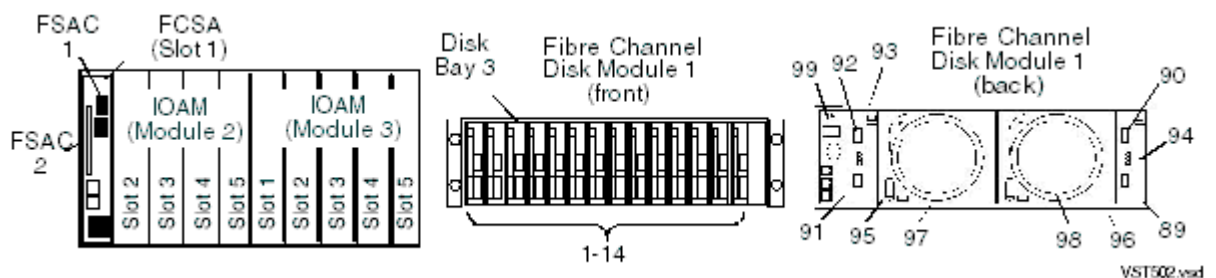
This table shows the default numbering for the Fibre Channel disk module:

IOAM Enclosure				FCDM		
Group	Module	Slot	FCSA F-SACs	Shelf	Slot	Item
110-115	2 - X fabric; 3 - Y fabric	1 - 5	1, 2	1 - 4 if daisy-chained; 1 if single disk enclosure	0	Fibre Channel disk module
					1-14	Disk drive bays
					89	Transceiver A1
					90	Transceiver A2
					91	Transceiver B1
					92	Transceiver B2
					93	Left FC-AL board
					94	Right FC-AL board
					95	Left power supply
					96	Right power supply
					97	Left blower
98	Right blower					
99	EMU					

The form of the GMS numbering for a disk in a Fibre Channel disk module is:



This example shows the disk in bay 03 of the Fibre Channel disk module that connects to the FCSA in the IOAM group 111, module 2, slot 1, FSAC 1:



System Installation Document Packet

To keep track of the hardware configuration, internal and external communications cabling, IP addresses, and connect networks, assemble and retain as the systems records an Installation Document Packet. This packet can include:

- “Technical Document for the Factory-Installed Hardware Configuration”
- “Configuration Forms for the ServerNet Adapters and CLIMs”

Technical Document for the Factory-Installed Hardware Configuration

Each new NonStop BladeSystem includes a document that describes:

- The cabinet included with the system
- Each hardware enclosure installed in the cabinet
- Cabinet U location of the bottom edge of each enclosure
- Each ServerNet cable with:
 - Source and destination enclosure, component, and connector
 - Cable part number
 - Source and destination connection labels

This document is called a technical document and serves as the physical location and connection map for the system.

Configuration Forms for the ServerNet Adapters and CLIMs

To add configuration forms for ServerNet adapters or CLIMs to your Installation Document Packet, copy the necessary forms from the adapter manuals or the *CLuster I/O Module (CLIM) Installation and Configuration Guide*. Follow any planning instructions in these manuals.

2 Site Preparation Guidelines

This section describes power, environmental, and space considerations for your site.

Modular Cabinet Power and I/O Cable Entry

Power and I/O cables can enter the NonStop BladeSystem from either the top or the bottom rear of the modular cabinets, depending on how the cabinets are ordered from HP and the routing of the AC power feeds at the site. NonStop BladeSystem cabinets can be ordered with the AC power cords for the PDUs exiting either:

- Top: Power and I/O cables are routed from above the modular cabinet.
- Bottom: Power and I/O cables are routed from below the modular cabinet

For information about modular cabinet power and cable options, refer to “AC Input Power for Modular Cabinets” (page 44).

Emergency Power-Off Switches

Emergency power off (EPO) switches are required by local codes or other applicable regulations when computer equipment contains batteries capable of supplying more than 750 volt-amperes (VA) for more than five minutes. Systems that have these batteries also have internal EPO hardware for connection to a site EPO switch or relay. In an emergency, activating the EPO switch or relay removes power from all electrical equipment in the computer room (except that used for lighting and fire-related sensors and alarms).

EPO Requirement for NonStop BladeSystems

NonStop BladeSystems without an optional UPS (such as an HP R12000/3 UPS) installed in the modular cabinet do not contain batteries capable of supplying more than 750 volt-amperes (VA) for more than five minutes, so they do not require connection to a site EPO switch.

EPO Requirement for HP R12000/3 UPS

The rack-mounted HP R12000/3, 12kVA UPS can be optionally installed in a modular cabinet, contains batteries, and has a remote EPO (REPO) port. For site EPO switches or relays, consult your HP site preparation specialist or electrical engineer regarding requirements.

If an EPO switch or relay connector is required for your site, contact your HP representative or refer to the *HP 3 Phase UPS User Guide* for connector and wiring for the 12kVA model. This guide is available at:

<http://bizsupport.austin.hp.com/bc/docs/support/SupportManual/c01079392/c01079392.pdf>

Electrical Power and Grounding Quality

Proper design and installation of a power distribution system for a NonStop BladeSystem requires specialized skills, knowledge, and understanding of appropriate electrical codes and the limitations of the power systems for computer and data processing equipment. For power and grounding specifications, refer to “AC Input Power for Modular Cabinets” (page 44).

Power Quality

This equipment is designed to operate reliably over a wide range of voltages and frequencies, described in “Enclosure AC Input” (page 45). However, damage can occur if these ranges are

exceeded. Severe electrical disturbances can exceed the design specifications of the equipment. Common sources of such disturbances are:

- Fluctuations occurring within the facility's distribution system
- Utility service low-voltage conditions (such as sags or brownouts)
- Wide and rapid variations in input voltage levels
- Wide and rapid variations in input power frequency
- Electrical storms
- Large inductive sources (such as motors and welders)
- Faults in the distribution system wiring (such as loose connections)

Computer systems can be protected from the sources of many of these electrical disturbances by using:

- A dedicated power distribution system
- Power conditioning equipment
- Lightning arresters on power cables to protect equipment against electrical storms

For steps to take to ensure proper power for the servers, consult with your HP site preparation specialist or power engineer.

Grounding Systems

The site building must provide a power distribution safety ground/protective earth for each AC service entrance to all NonStop BladeSystem equipment. This safety grounding system must comply with local codes and any other applicable regulations for the installation locale.

For proper grounding/protective earth connection, consult with your HP site preparation specialist or power engineer.

Power Consumption

In a NonStop BladeSystem, the power consumption and inrush currents per connection can vary because of the unique combination of enclosures housed in the modular cabinet. Thus, the total power consumption for the hardware installed in the cabinet should be calculated as described in "Enclosure Power Loads" (page 46).

Uninterruptible Power Supply (UPS)

Modular cabinets do not have built-in batteries to provide power during power failures. To support system operation and ride-through support during a power failure, NonStop BladeSystems require either an optional UPS (HP supports the HP model R12000/3 UPS) installed in each modular cabinet or a site UPS to support system operation through a power failure. This system operation support can include a planned orderly shutdown at a predetermined time in the event of an extended power failure. A timely and orderly shutdown prevents an uncontrolled and asymmetric shutdown of the system resources from depleted UPS batteries.

OSM provides this ride-through support during a power failure. When OSM detects a power failure, it triggers a ride-through timer. To set this timer, you must configure the ride-through time in SCF. For this information, refer to the *SCF Reference Manual for the Kernel Subsystem*. If AC power is not restored before the configured ride-through time period ends, OSM initiates an orderly shutdown of I/O operations and processors. For additional information, see "AC Power Monitoring" (page 95).



NOTE: Retrofitting a system in the field with a UPS and ERMs will likely require moving all installed enclosures in the rack to provide space for the new hardware. One or more of the enclosures that formerly resided in the rack might be displaced and therefore have to be installed in another rack that would also need a UPS and ERMs installed. Additionally, lifting equipment might be required to lift heavy enclosures to their new location.

For information and specifications on the R12000/3 UPS, see Chapter 3 (page 37) and refer to the *HP 3 Phase UPS User Guide*. This guide is available at:

<http://bizsupport.austin.hp.com/bc/docs/support/SupportManual/c01079392/c01079392.pdf>

If you install a UPS other than the HP model R12000/3 UPS in each modular cabinet of a NonStop BladeSystem, these requirements must be met to insure the system can survive a total AC power fail:

- The UPS output voltage can support the HP PDU input voltage requirements.
- The UPS phase output matches the PDU phase input. For NonStop BladeSystems, 3-phase output UPSs and 3-phase input HP PDUs are supported. For details, refer to Chapter 3 (page 37).
- The UPS output can support the targeted system in the event of an AC power failure. Calculate each cabinet load to insure the UPS can support a proper ride-through time in the event of a total AC power failure. For more information, refer to “Enclosure Power Loads” (page 46).



NOTE: A UPS other than the HP model R12000/3 UPS will not be able to utilize the power fail support of the **Configure a Power Source as UPS** OSM action.

If your applications require a UPS that supports the entire system or even a UPS or motor generator for all computer and support equipment in the site, you must plan the site’s electrical infrastructure accordingly.

Cooling and Humidity Control

Do not rely on an intuitive approach to design cooling or to simply achieve an energy balance—that is, summing up to the total power dissipation from all the hardware and sizing a comparable air conditioning capacity. Today’s high-performance NonStop BladeSystems use semiconductors that integrate multiple functions on a single chip with very high power densities. These chips, plus high-power-density mass storage and power supplies, are mounted in ultra-thin system and storage enclosures, and then deployed into computer racks in large numbers. This higher concentration of devices results in localized heat, which increases the potential for hot spots that can damage the equipment.

Additionally, variables in the installation site layout can adversely affect air flows and create hot spots by allowing hot and cool air streams to mix. Studies have shown that above 70°F (20°C), every increase of 18°F (10°C) reduces long-term electronics reliability by 50%.

Cooling airflow through each enclosure in the NonStop BladeSystem is front-to-back. Because of high heat densities and hot spots, an accurate assessment of air flow around and through the system equipment and specialized cooling design is essential for reliable system operation. For an airflow assessment, consult with your HP cooling consultant or your heating, ventilation, and air conditioning (HVAC) engineer.



NOTE: Failure of site cooling with the NonStop BladeSystem continuing to run can cause rapid heat buildup and excessive temperatures within the hardware. Excessive internal temperatures can result in full or partial system shutdown. Ensure that the site's cooling system remains fully operational when the NonStop BladeSystem is running.

Because each modular cabinet houses a unique combination of enclosures, use the “Heat Dissipation Specifications and Worksheet” (page 50) to calculate the total heat dissipation for the hardware installed in each cabinet. For air temperature levels at the site, refer to “Operating Temperature, Humidity, and Altitude” (page 50).

Weight

Because modular cabinets for NonStop BladeSystems house a unique combination of enclosures, total weight must be calculated based on what is in the specific cabinet, as described in “Modular Cabinet and Enclosure Weights With Worksheet ” (page 49).

Flooring

NonStop BladeSystems can be installed either on the site's floor with the cables entering from above the equipment or on raised flooring with power and I/O cables entering from underneath. Because cooling airflow through each enclosure in the modular cabinets is front-to-back, raised flooring is not required for system cooling.

The site floor structure and any raised flooring (if used) must be able to support the total weight of the installed computer system as well as the weight of the individual modular cabinets and their enclosures as they are moved into position. To determine the total weight of each modular cabinet with its installed enclosures, refer to “Modular Cabinet and Enclosure Weights With Worksheet ” (page 49).

For your site's floor system, consult with your HP site preparation specialist or an appropriate floor system engineer. If raised flooring is to be used, the design of the NonStop BladeSystem modular cabinet is optimized for placement on 24-inch floor panels.

Dust and Pollution Control

NonStop BladeSystems do not have air filters. Any computer equipment can be adversely affected by dust and microscopic particles in the site environment. Airborne dust can blanket electronic components on printed circuit boards, inhibiting cooling airflow and causing premature failure from excess heat, humidity, or both. Metallically conductive particles can short circuit electronic components. Tape drives and some other mechanical devices can experience failures resulting from airborne abrasive particles.

For recommendations to keep the site as free of dust and pollution as possible, consult with your heating, ventilation, and air conditioning (HVAC) engineer or your HP site preparation specialist.

Zinc Particulates

Over time, fine whiskers of pure metal can form on electroplated zinc, cadmium, or tin surfaces such as aged raised flooring panels and supports. If these whiskers are disturbed, they can break off and become airborne, possibly causing computer failures or operational interruptions. This metallic particulate contamination is a relatively rare but possible threat. Kits are available to test for metallic particulate contamination, or you can request that your site preparation specialist or HVAC engineer test the site for contamination before installing any electronic equipment.

Space for Receiving and Unpacking the System

Identify areas that are large enough to receive and to unpack the system from its shipping cartons and pallets. Be sure to allow adequate space to remove the system equipment from the shipping

pallets using supplied ramps. Also be sure adequate personnel are present to remove each cabinet from its shipping pallet and to safely move it to the installation site.



WARNING! A fully populated cabinet is unstable when moving down the unloading ramp from its shipping pallet. Arrange for enough personnel to stabilize each cabinet during removal from the pallet and to prevent the cabinet from falling. A falling cabinet can cause serious or fatal personal injury.

Ensure sufficient pathways and clearances for moving the NonStop BladeSystem equipment safely from the receiving and unpacking areas to the installation site. Verify that door and hallway width and height as well as floor and elevator loading will accommodate not only the system equipment but also all required personnel and lifting or moving devices. If necessary, enlarge or remove any obstructing doorway or wall.

All modular cabinets have small casters to facilitate moving them on hard flooring from the unpacking area to the site. Because of these small casters, rolling modular cabinets along carpeted or tiled pathways might be difficult. If necessary, plan for a temporary hard floor covering in affected pathways for easier movement of the equipment.

For physical dimensions of the NonStop BladeSystem equipment, refer to “Dimensions and Weights” (page 47).

Operational Space

When planning the layout of the NonStop BladeSystem site, use the equipment dimensions, door swing, and service clearances listed in “Dimensions and Weights” (page 47). Because location of the lighting fixtures and electrical outlets affects servicing operations, consider an equipment layout that takes advantage of existing lighting and electrical outlets.

Also consider the location and orientation of current or future air conditioning ducts and airflow direction and eliminate any obstructions to equipment intake or exhaust air flow. Refer to “Cooling and Humidity Control” (page 33).

Space planning should also include the possible addition of equipment or other changes in space requirements. Depending on the current or future equipment installed at your site, layout plans can also include provisions for:

- Channels or fixtures used for routing data cables and power cables
- Access to air conditioning ducts, filters, lighting, and electrical power hardware
- Communications cables, patch panels, and switch equipment
- Power conditioning equipment
- Storage area or cabinets for supplies, media, and spare parts

3 System Installation Specifications

This section provides specifications necessary for system installation planning.



NOTE: All specifications provided in this section assume that each enclosure in the modular cabinet is fully populated. The maximum current for each AC service depends on the number and type of enclosures installed in the modular cabinet. Power, weight, and heat loads are less when enclosures are not fully populated; for example, a Fibre Channel disk module with fewer disks.

Modular Cabinets

The modular cabinet is a EIA standard 19-inch, 42U rack for mounting modular components. The modular cabinet comes equipped with front and rear doors and includes a rear extension that makes it deeper than some industry-standard racks. The “Power Distribution Units (PDUs)” (page 42) are mounted along the rear extension without occupying any U-space in the cabinet and are oriented inward, facing the components within the rack.

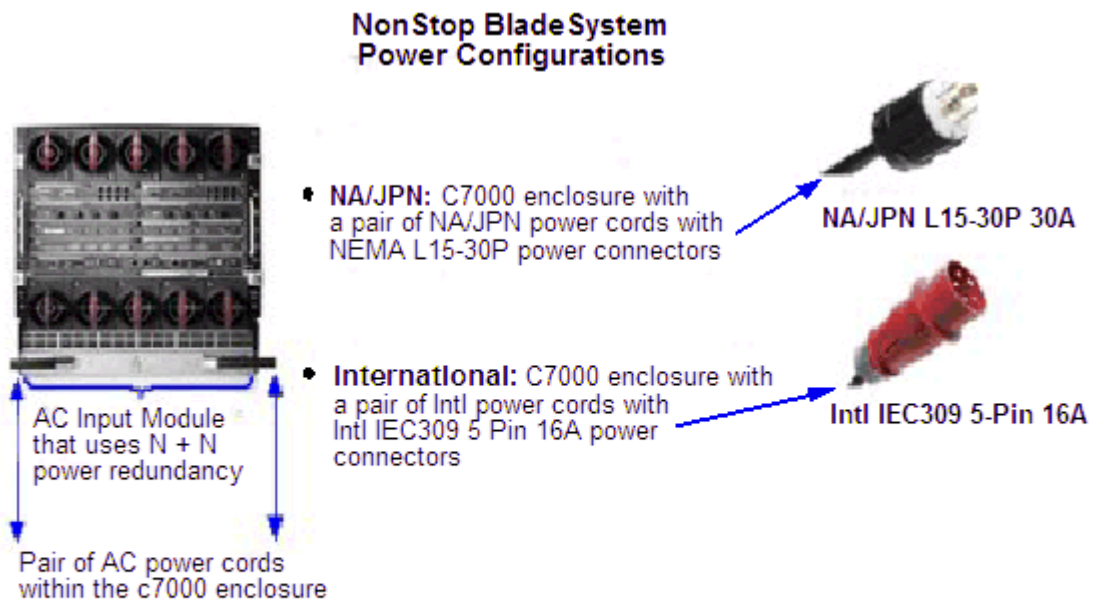
NonStop BladeSystem Power Distribution

There are two power configurations for NonStop BladeSystems:

- North America/Japan (NA/JPN): requires 208V three phase (120V phase to neutral) and loads wired phase-to-phase
- International (INTL): requires 400V three phase with loads wired phase to neutral (230V)

Both power configurations require 200V to 240V distribution and careful attention to phase load balancing. For more information, see “Phase Load Balancing” (page 45).

The NonStop BladeSystem's three-phase, c7000 enclosure contains an AC Input Module that provides 2N redundant power distribution for the power configurations. This power module comes with a pair of power cords that provide direct AC power feeds to the c7000 enclosure:



VET700.usd

One c7000 power feed is from the main power source and the other is from a backup UPS grid. For the R12000/3 UPS installed in a rack, the backup power source for the c7000 is one of the dedicated three phase outputs. There is no power sharing between the c7000 and the rack PDU feed. Two three-phase rack PDUs power all the other components except the c7000 in the NonStop BladeSystem. One PDU is connected to the main power input grid: the other to the backup grid. For racks with integral UPS, this is one of the dedicated three phase outputs of the UPS. For c7000 power setup details, see “Power Feed Setup for the NonStop BladeSystem” (page 38)

There are two different versions of the rack level PDU. For more details, see “Power Distribution Units (PDUs)” (page 42) and “AC Input Power for Modular Cabinets” (page 44).

Power Feed Setup for the NonStop BladeSystem

Power set up depends on your power configuration type:

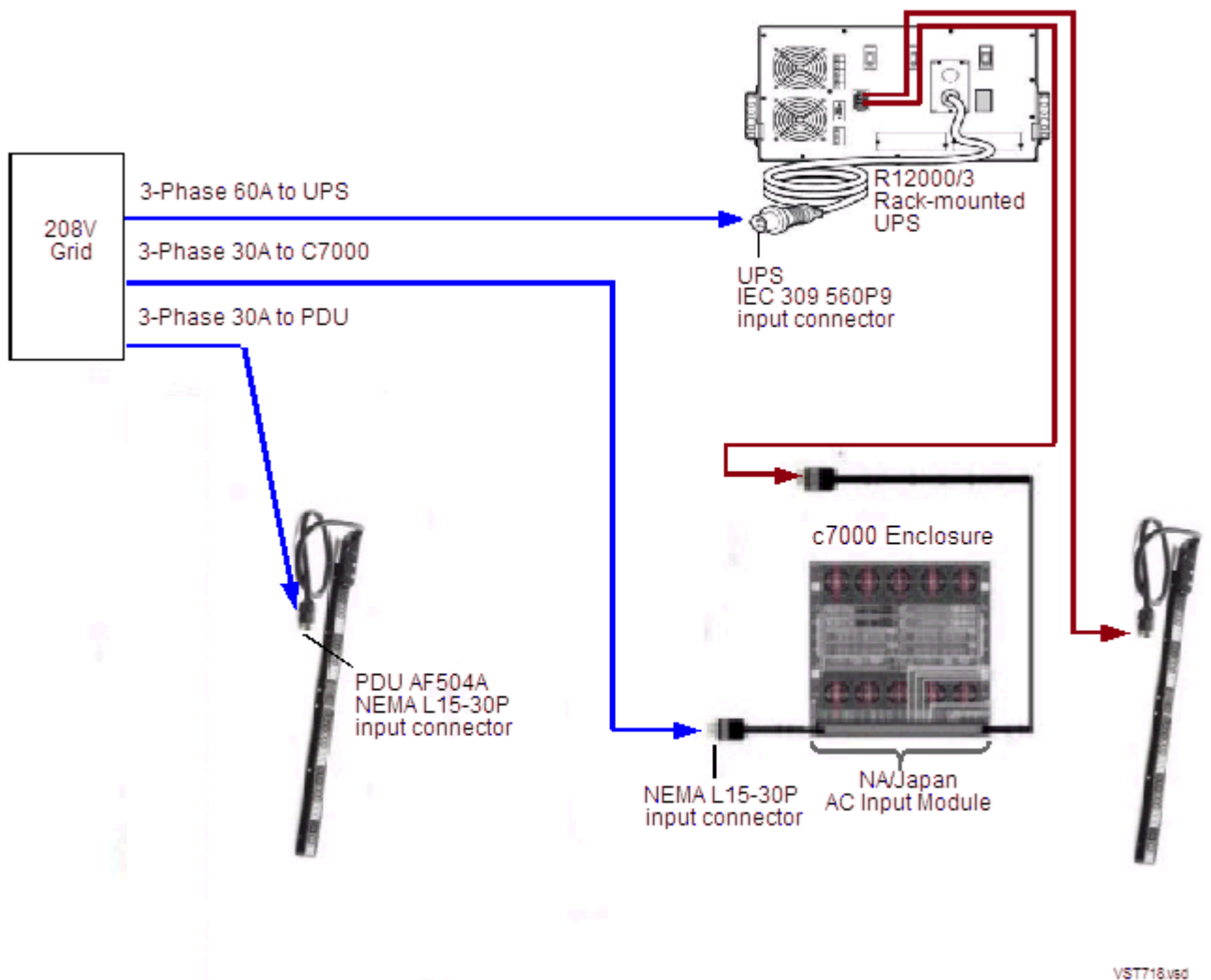
- “North America/Japan Power Setup With Rack-Mounted UPS”
- “North America/Japan Power Setup Without Rack-Mounted UPS” (page 39)
- “International Power Setup With Rack-Mounted UPS” (page 40)
- “International Power Setup Without Rack-Mounted UPS” (page 41)

North America/Japan Power Setup With Rack-Mounted UPS

To setup the power feed connections as shown in Figure 3-1:

1. Connect one 3-phase 60A power feed to the rack-mounted UPS IEC309 560P9 (60A, 5 wire/4 pole) input connector.
2. Connect one 3-phase 30A power feed to the AF504A PDU NEMA L15-30P (30A, 4 wire/3 pole) input connector.
3. Connect one 3-phase 30A power feed to the c7000 enclosure's NEMA L15-30P (30A, 4 wire/3 pole) input connector.

Figure 3-1 North America/Japan 3-Phase Power Setup With Rack-Mounted UPS

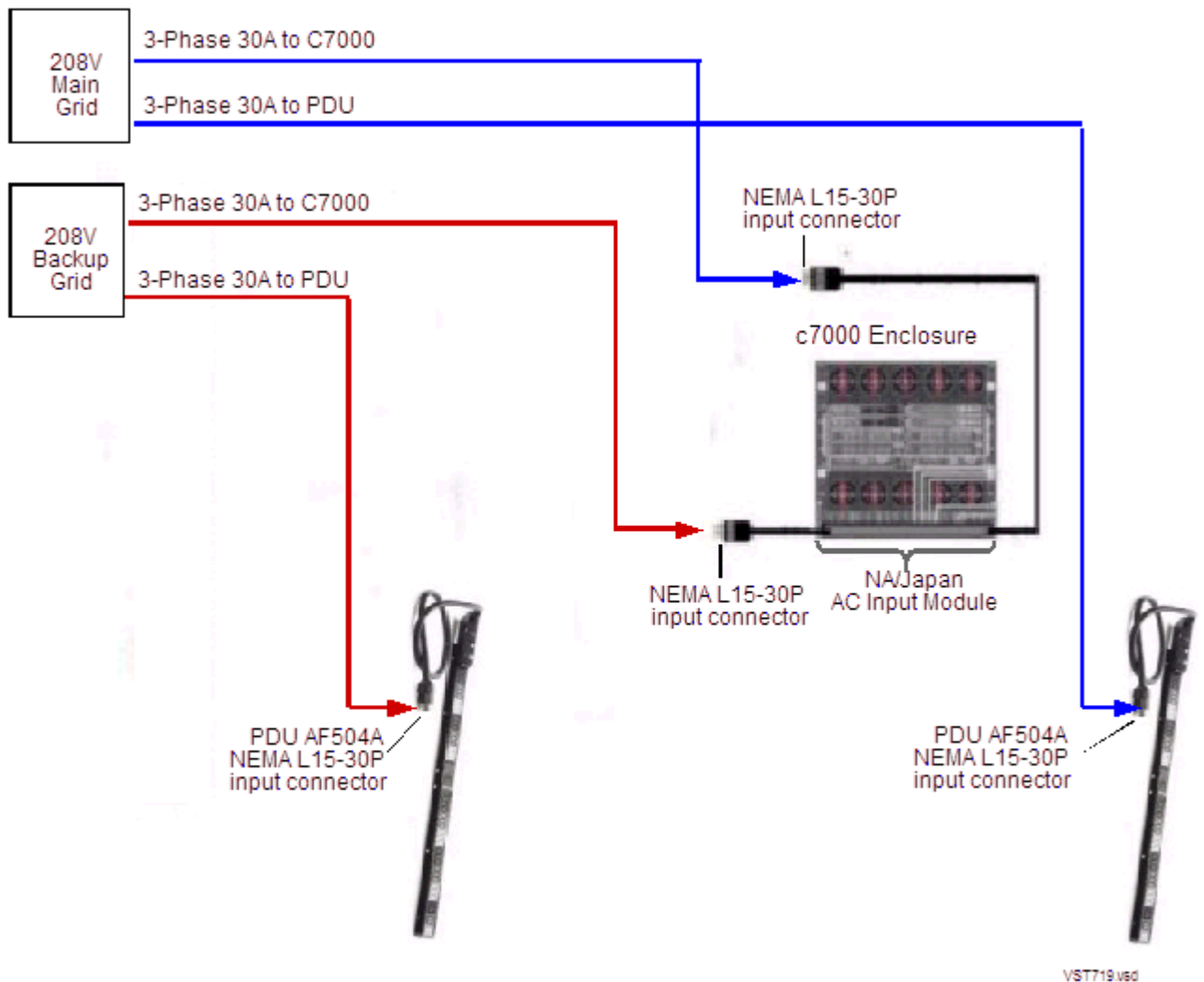


North America/Japan Power Setup Without Rack-Mounted UPS

To setup the power feed connections as shown in Figure 3-2:

1. Connect two 3-phase 30A power feeds to the two AF504A PDU NEMA L15-30P (30A, 4 wire/3 pole) input connectors.
2. Connect two 3-phase 30A power feeds to the two NEMA L15-30P (30A, 4 wire/3 pole) input connectors within the c7000 enclosure.

Figure 3-2 North America/Japan Power Setup

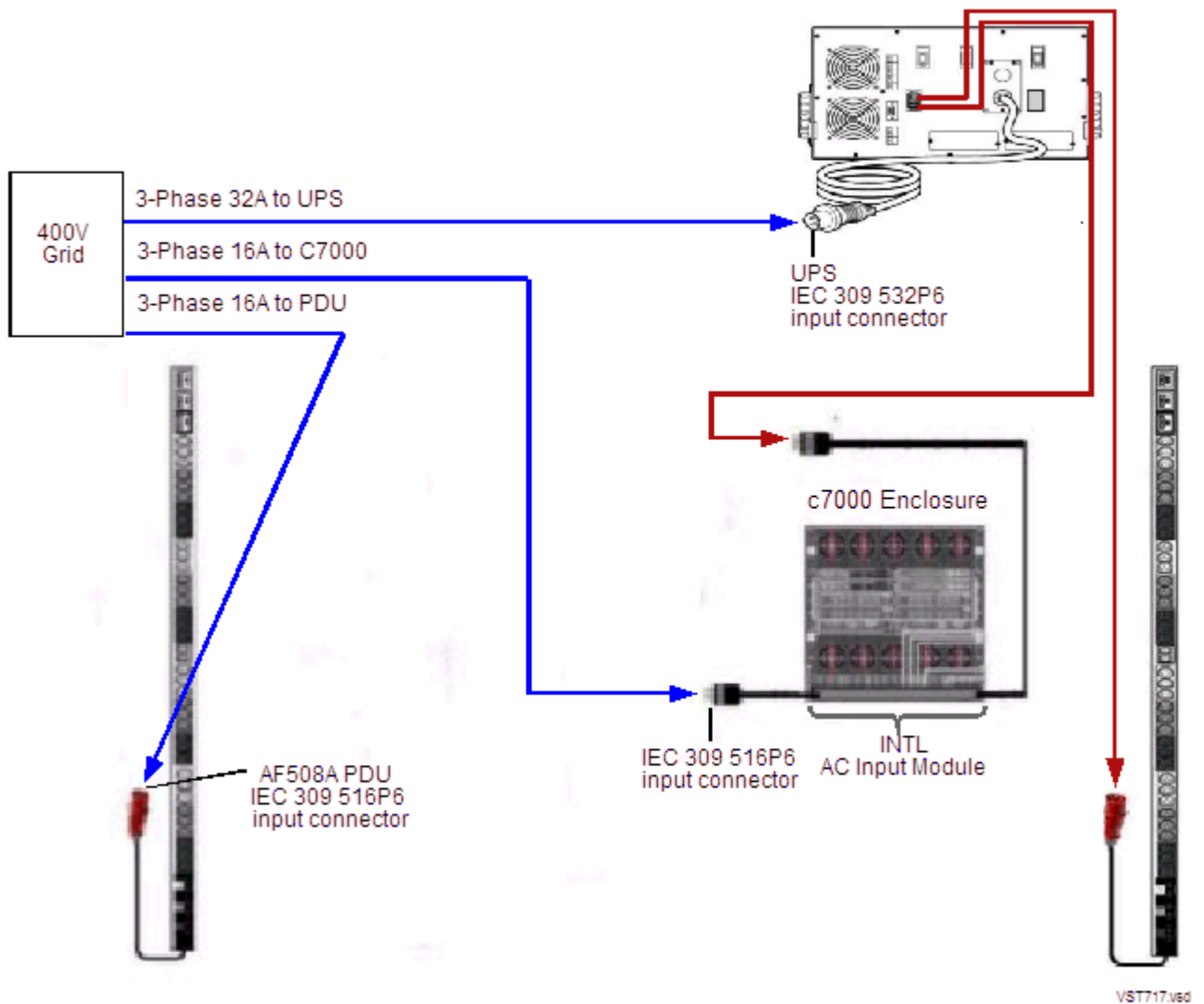


International Power Setup With Rack-Mounted UPS

To setup the power feed connections as shown in Figure 3-3 (page 41):

1. Connect one 3-phase 32A power feed to the rack-mounted UPS IEC309 532P6 (32A, 5 wire/4 pole) input connector.
2. Connect one 3-phase 16A power feed to the AF508A PDU IEC309 516P6 (16A, 5 wire/4 pole) input connector.
3. Connect one 3-phase 16A power feed to the c7000 enclosure's IEC309 516P6 (16A, 5 wire/4 pole) input connector.

Figure 3-3 International 3-Phase Power Setup With UPS

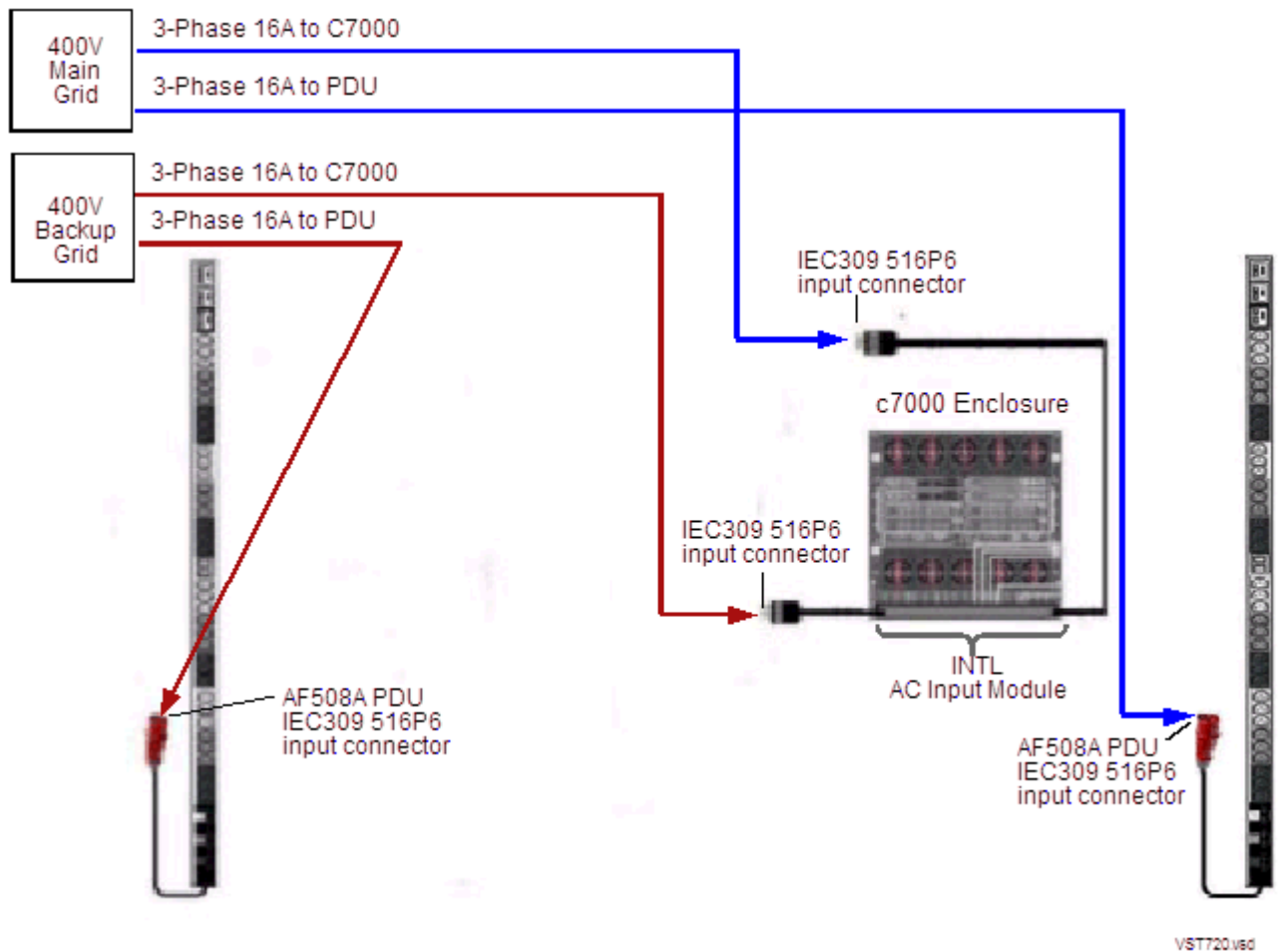


International Power Setup Without Rack-Mounted UPS

To setup the power feed connections as shown in Figure 3-4:

1. Connect two 3-phase 16A power feeds to the two AF508A PDU IEC309 516P6 (16A, 5 wire/4 pole) input connectors.
2. Connect two 3-phase 16A power feeds to the two IEC309 516P6 (16A, 5 wire/4 pole) input connectors within the c7000 enclosure.

Figure 3-4 International Power Setup Without Rack-Mounted UPS



Power Distribution Units (PDUs)

Two power distribution units (PDUs) are installed to provide redundant power outlets for the components mounted in the modular cabinet. The PDUs are oriented inward, facing the components within the rack. Each PDU is 60 inches long and has 39 AC receptacles, three circuit breakers, and an AC power cord. The PDU is oriented with the AC power cord exiting the modular cabinet at either the top or bottom rear corners of the cabinet, depending on the site's power feed needs.

For information about specific PDU input and output characteristics for PDUs factory-installed in modular cabinets, refer to “AC Input Power for Modular Cabinets” (page 44).

Each PDU in a modular cabinet has:

- 36 AC receptacles per PDU (12 per segment) - IEC 320 C13 10A receptacle type
- 3 AC receptacles per PDU (1 per segment) - IEC 320 C19 16A receptacle type
- 3 circuit-breakers

These PDU options are available to receive power from the site AC power source:

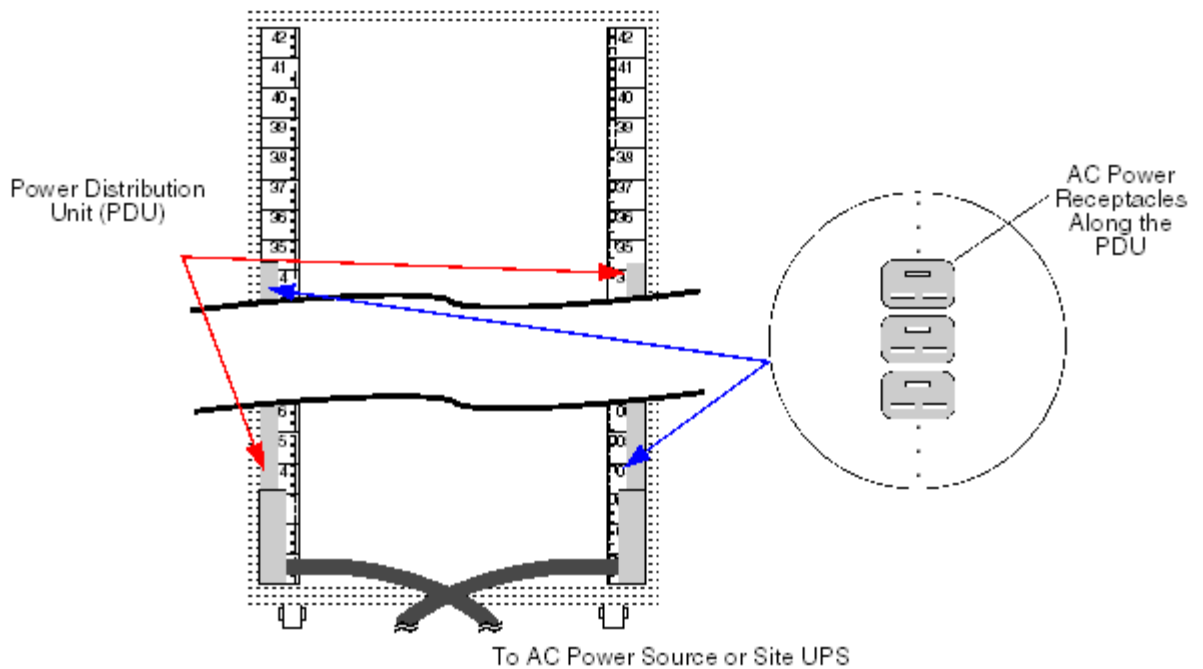
- 208 V AC, three-phase delta for North America and Japan
- 400 V AC, three-phase wye for International

Each PDU distributes site three-phase power to 39 single-phase 200 to 240 V AC outlets for connecting the power cords from the components mounted in the modular cabinet.

The AC power feed cables for the PDUs are mounted to exit the modular cabinet at either the top or bottom rear corners of the cabinet depending on what is ordered for the site's power feed.

Figure 3-5 shows the power feed cables on PDUs with AC feed at the bottom of the cabinet and the AC power outlets along the PDU. These power outlets face in toward the components in the cabinet.

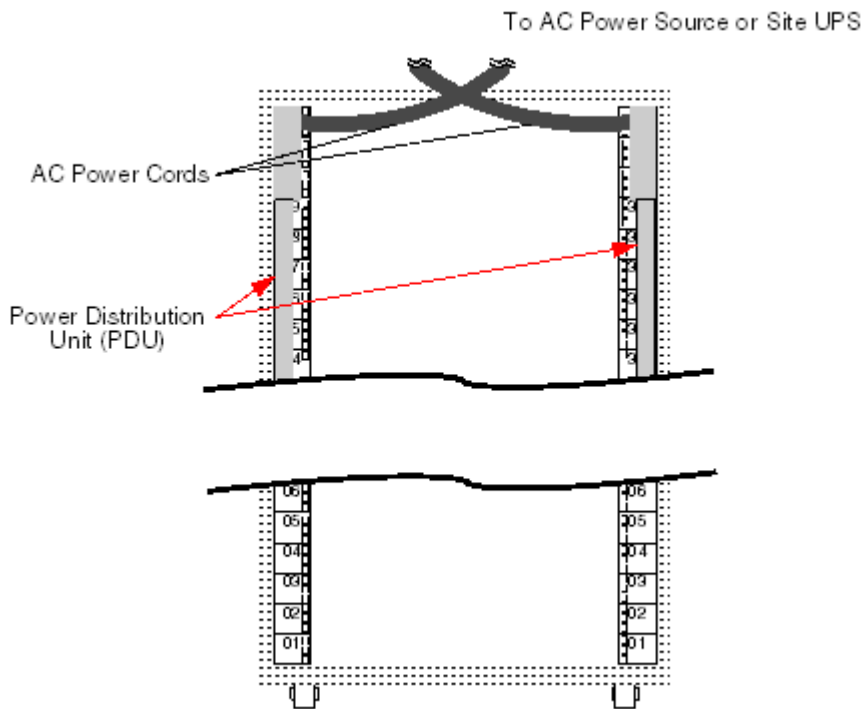
Figure 3-5 Bottom AC Power Feed



VST152.vsd

Figure 3-6 shows the power feed cables on PDUs with AC feed at the top of the cabinet:

Figure 3-6 Top AC Power Feed



VST140.vsd

AC Input Power for Modular Cabinets

This subsection provides information about AC input power for modular cabinets and covers these topics:

- “North America and Japan: 208 V AC PDU Power”
- “International: 400 V AC PDU Power”
- “Branch Circuits and Circuit Breakers”
- “Enclosure AC Input” (page 45)
- “Enclosure Power Loads” (page 46)

Power can enter the NonStop BladeSystem from either the top or the bottom rear of the modular cabinets, depending on how the cabinets are ordered from HP and the AC power feeds are routed at the site. NonStop BladeSystem cabinets can be ordered with the AC power cords for the PDU installed either:

- Top: Power and I/O cables are routed from above the modular cabinet.
- Bottom: Power and I/O cables are routed from below the modular cabinet

For information on the modular cabinets, refer to “Modular Cabinets” (page 37). For information on the PDUs, refer to “Power Distribution Units (PDUs)” (page 42).

North America and Japan: 208 V AC PDU Power

The cabinet includes two power distribution units (PDU). The PDU power characteristics are:

PDU input characteristics	<ul style="list-style-type: none">• 208 V AC, 3-phase delta, 24A RMS, 4-wire• 50/60Hz• NEMA L15-30 input plug• 6.5 feet (2 m) attached power cord
PDU output characteristics	<ul style="list-style-type: none">• 3 circuit-breaker-protected 13.86A load segments• 36 AC receptacles per PDU (12 per segment) - IEC 320 C13 10A receptacle type• 3 AC receptacles per PDU (1 per segment) - IEC 320 C19 16A receptacle type

International: 400 V AC PDU Power

The cabinet includes two power distribution units (PDU). The PDU power characteristics are:

PDU input characteristics	<ul style="list-style-type: none">• 380 to 415 V AC, 3-phase Wye, 16A RMS, 5-wire• 50/60Hz• IEC309 5-pin, 16A input plug• 6.5 feet (2 m) attached harmonized power cord
PDU output characteristics	<ul style="list-style-type: none">• 3 circuit-breaker-protected 16A load segments• 36 AC receptacles per PDU (12 per segment) - IEC 320 C13 10A receptacle type• 3 AC receptacles per PDU (1 per segment) - IEC 320 C19 16A receptacle type

Branch Circuits and Circuit Breakers

Modular cabinets for the NonStop BladeSystem contain two PDUs.

In cabinets without the optional rack-mounted UPS, each of the two PDUs requires a separate branch circuit of these ratings:

Region	Volts	Amps (see following "CAUTION")
North America and Japan	208	30
International	400	16 ¹

¹ Category D circuit breaker is required.



CAUTION: Be sure the hardware configuration and resultant power loads of each cabinet within the system do not exceed the capacity of the branch circuit according to applicable electrical codes and regulations.

Branch circuit requirements vary by the input voltage and the local codes and applicable regulations regarding maximum circuit and total distribution loading.

Select circuit breaker ratings according to local codes and any applicable regulations for the circuit capacity. Note that circuit breaker ratings vary if your system includes the optional rack-mounted HP Model R12000/3 Integrated UPS.

These ratings apply to systems with the optional rack-mounted HP Model R12000/3 Integrated UPS:

Version	Operating Voltage Settings	Power Out (VA/Watts)	Input Plug	UPS Input Rating ¹
North America and Japan	208	12000	IEC-309 60 Amp	Dedicated 36 Amp
International	230	12000	IEC-309 32 Amp	Dedicated 24 Amp

¹ The UPS input requires a dedicated (unshared) branch circuit that is suitably rated for your specific UPS.

For further information and specifications on the R12000/3 UPS (12kVA model), refer to the *HP 3 Phase UPS User Guide* for the 12kVA model. This guide is available at:

<http://bizsupport.austin.hp.com/bc/docs/support/SupportManual/c01079392/c01079392.pdf>

Enclosure AC Input

Enclosures (c7000, IP CLIM, IOAM enclosure, and so forth) require:

Specification	Value
Nominal input voltage	200/208/220/230/240 V AC RMS
Voltage range*	180-264 V AC
Nominal line frequency	50 or 60 Hz
Frequency ranges	47-53 Hz or 57-63 Hz
Number of phases (c7000 enclosure only)	3
Number of phases (all other components)	1

Phase Load Balancing

Each PDU is wired such that there are three load segments with groups of outlets alternating between load segments, going up and down the PDU. Refer to "Power Distribution Units (PDUs)" (page 42). Factory-installed enclosures, other than the c7000, are connected to the PDUs on alternating load segments to facilitate phase load balancing. The c7000 has its own three-phase

input, with each phase (International) or pairs of phases (North America/Japan) associated with one of the c7000 power supplies. When the c7000 is operating in Dynamic Power Saving Mode, the minimum number of power supplies are enabled to redundantly power the enclosure. This mode increases power supply efficiency, but leaves the phases or phase pairs associated with the disabled power supplies unloaded. For multiple-cabinet installations, in order to balance phase loads when Dynamic Power Saving Mode is enabled, HP recommends rotating the phases from one cabinet to the next. For example, if the first cabinet is wired A-B-C, the next cabinet should be wired B-C-A, and the next C-A-B, and so on.

Enclosure Power Loads

The total power and current load for a modular cabinet depends on the number and type of enclosures installed in it. Therefore, the total load is the sum of the loads for all enclosures installed. For examples of calculating the power and current load for various enclosure combinations, refer to “Calculating Specifications for Enclosure Combinations” (page 51).

In normal operation, the AC power is split equally between the two PDUs in the modular cabinet. However, if one of the two AC power feeds fails, the remaining AC power feed and PDU must carry the power for all enclosures in that cabinet.

Power and current specifications for each type of enclosure are:

Enclosure Type	AC Power Lines per Enclosure ¹	Apparent Power (volt-amps measured on single AC line with one line powered)	Apparent Power (volt-amps measured on single AC line with both lines powered) ²		Peak Inrush Current (amps)
			Per line:	Total:	
c7000 ³	2	4300	2200	4400	210
IP CLIM	2	320	185	370	15
Storage CLIM	2	320	185	370	15
SAS disk enclosure	2	260	140	280	5
IOAM enclosure	2	262	163	326	30
Fibre Channel disk module ⁴	2	290	174	348	14
Rack-mounted system console	1	176	-	-	27
Rack-mounted keyboard and monitor	1	28	-	-	2
Maintenance switch (Ethernet) ⁵	1	44	-	-	4

1 See “Power Feed Setup for the NonStop BladeSystem” (page 38) for c7000 enclosure power feed requirements.

2 Total apparent power is the sum of the two AC power lines feeding the enclosure. Electrical load is shared equally between the two lines.

3 Decrease the apparent power VA specification by 508VA for each empty Nonstop server blade slot. For example, a c7000 that only has four NonStop Server Blades installed would be rated 4400 VA minus (4 server blades x 508 VA) = 2370 VA apparent power.

4 Measured with 14 disk drives installed and active.

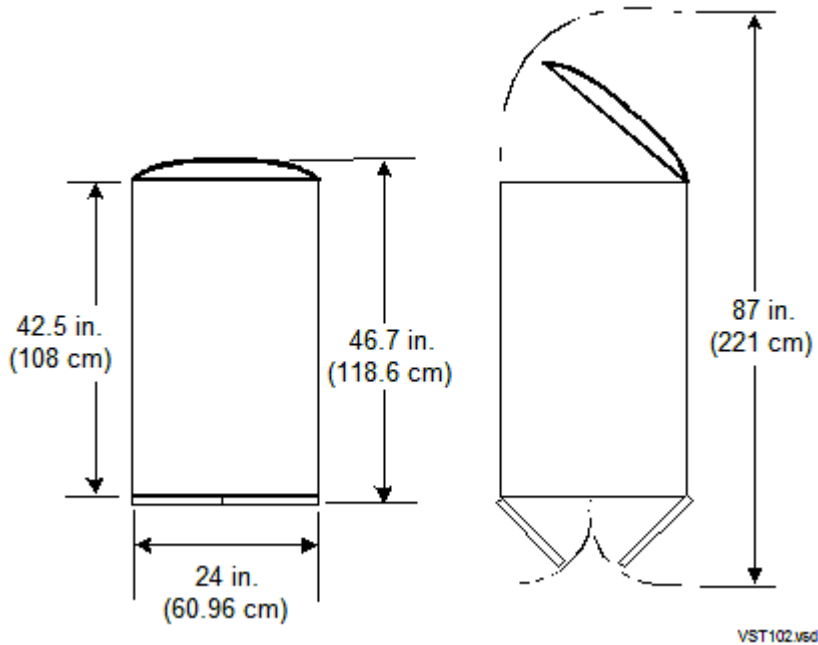
5 Maintenance switch has only one AC plug.

Dimensions and Weights

This subsection provides information about the dimensions and weights for modular cabinets and enclosures installed in a modular cabinet and covers these topics:

- “Plan View of the 42U Modular Cabinet”
- “Service Clearances for the Modular Cabinets”
- “Unit Sizes”
- “42U Modular Cabinet Physical Specifications” (page 48)
- “Enclosure Dimensions” (page 48)
- “Modular Cabinet and Enclosure Weights With Worksheet ” (page 49)

Plan View of the 42U Modular Cabinet



Service Clearances for the Modular Cabinets

Aisles: 6 feet (182.9 centimeters)

Front: 3 feet (91.4 centimeters)

Rear: 3 feet (91.4 centimeters)

Unit Sizes

Enclosure Type	Height (U)
Modular cabinet	42
c7000 enclosure	10
IP CLIM	2
Storage CLIM	2
SAS disk enclosure	2
IOAM enclosure	11
Fibre Channel disk module (FCDM)	3

Enclosure Type	Height (U)
Maintenance switch (Ethernet)	1
R12000/3 UPS	6
Extended runtime module	3
Rack-mounted system console	2

42U Modular Cabinet Physical Specifications

Item	Height		Width		Depth		Weight
	in.	cm	in.	cm	in.	cm	
Modular cabinet	78.7	199.9	24.0	60.96	46.7	118.6	Depends on the enclosures installed. Refer to “Modular Cabinet and Enclosure Weights With Worksheet ” (page 49).
Rack	78.5	199.4	23.62	60.0	42.5	108.0	
Front door	78.5	199.4	23.5	59.7	3.2	8.1	
Left-rear door	78.5	199.4	11.0	27.9	1.0	2.5	
Right-rear door	78.5	199.4	12.0	30.5	1.0	2.5	
Shipping (palletized)	86.5	219.71	35.75	90.80	54.25	137.80	

Enclosure Dimensions

EnclosureType	Height		Width		Depth	
	in	cm	in	cm	in	cm
c7000 enclosure	17.4	44.1	17.5	44.4	32	81.2
IP or Storage CLIM	3.3	8.5	17.5	44.5	26	66
SAS disk enclosure	3.4	8.8	17.6	44.8	23.2	59
IOAM enclosure	19.25	48.9	19.0	48.3	27.0	68.6
Fibre Channel disk module	5.2	13.1	19.9	50.5	17.6	44.8
Maintenance switch (Ethernet)	1.8	4.6	17.4	44.2	8.0	20.3
Rack-mounted system console with keyboard and display	1.7	4.3	16.8	42.7	24.0	60.9
R12000/3 UPS	10.3	26.1	26	66	14.4	36.5
Extended runtime module (ERM)	5.2	13.2	26	66	17.2	43.6

Modular Cabinet and Enclosure Weights With Worksheet

The total weight of each modular cabinet is the sum the weights of the cabinet plus each enclosure installed in it. Use this worksheet to determine the total weight:

EnclosureType	Number of Enclosures	Weight		Total	
		lbs	kg	lbs	kg
Modular cabinet ¹ 42U		303	137		
c7000 Enclosure		480	218		
IOAM enclosure		235	106		
Fibre Channel disk module (FCDM)		78	35		
IP or Storage CLIM		60	27		
SAS disk enclosure		48	25		
Maintenance switch (Ethernet)		6	3		
Rack-mounted system console with keyboard and display		34	15		
R12000/3 UPS		307 (with batteries)	139.2 (with batteries)		
		135 (without batteries)	59.8 (without batteries)		
Extended runtime module (ERM)		170	77		
Total		--	--		

1 Modular cabinet weight includes the PDUs and their associated wiring and receptacles.

For examples of calculating the weight for various enclosure combinations, refer to “Calculating Specifications for Enclosure Combinations” (page 51).

Modular Cabinet Stability

Cabinet stabilizers are required when you have less than four cabinets bayed together.



NOTE: Cabinet stability is of special concern when equipment is routinely installed, removed, or accessed within the cabinet. Stability is addressed through the use of leveling feet, baying kits, fixed stabilizers, and/or ballast.

For information about best practices for cabinets, your service provider can consult:

- *HP 10000 G2 Series Rack User Guide*
- *Best practices for HP 10000 Series and HP 10000 G2 Series Racks*

Environmental Specifications

This subsection provides information about environmental specifications and covers these topics:

- “Heat Dissipation Specifications and Worksheet”
- “Operating Temperature, Humidity, and Altitude”
- “Nonoperating Temperature, Humidity, and Altitude” (page 51)
- “Cooling Airflow Direction” (page 51)
- “Typical Acoustic Noise Emissions” (page 51)
- “Tested Electrostatic Immunity” (page 51)

Heat Dissipation Specifications and Worksheet

Enclosure Type	Number Installed	Unit Heat (BTU/hour with single AC line powered)	Unit Heat (BTU/hour with both AC lines powered)	Total (BTU/hour)
c7000 ¹		12400	13700	
IP or Storage CLIM		1070	1236	
SAS disk enclosure		869	936	
IOAM ²		893	1112	
Fibre Channel disk module (FCDM) ³		990	1187	
Maintenance switch (Ethernet) ⁴		150	-	
Rack-mounted system console with keyboard and display		696	-	

- 1 Decrease the BTU/hour specification by 1730 BTU/hour for each empty NonStop Server Blade slot. For example, a c7000 that only has four NonStop Server Blades installed would be rated 13700 BTU/hour minus (4 server blades x 1730 BTU/hour) = 6780 BTU/hour.
- 2 Measured with 10 Fibre Channel ServerNet adapters installed and active.
- 3 Measured with 14 disk drives installed and active.
- 4 Maintenance switch has only one plug.

Operating Temperature, Humidity, and Altitude

Specification	Operating Range ¹	Recommended Range ¹	Maximum Rate of Change per Hour
Temperature (IOAM, rack-mounted system console, and maintenance switch)	41° to 95° F (5° to 35° C)	68° to 72° F (20° to 25° C)	9° F (5° C) Repetitive 36° F (20° C) Nonrepetitive
Temperature (c7000, CLIMs, SAS disk enclosure, and Fibre Channel disk module)	50° to 95° F (10° to 35° C)	-	0.6° F (1° C) Repetitive 1.6° F (3° C) Nonrepetitive
Humidity (all except c7000 enclosure)	15% to 80%, noncondensing	40% to 50%, noncondensing	6%, noncondensing
Humidity (c7000 enclosure)	20% to 80%, noncondensing	40% to 55%, noncondensing	6%, noncondensing
Altitude ²	0 to 10,000 feet (0 to 3,048 meters)	-	-

- 1 Operating and recommended ranges refer to the ambient air temperature and humidity measured 19.7 in. (50 cm) from the front of the air intake cooling vents.
- 2 For each 1000 feet (305 m) increase in altitude above 10,000 feet (up to a maximum of 15,000 feet), subtract $1.5 \times F$ ($0.83 \times C$) from the upper limit of the operating and recommended temperature ranges.

Nonoperating Temperature, Humidity, and Altitude

- Temperature:
 - Up to 72-hour storage: -40° to 150° F (-40° to 66° C)
 - Up to 6-month storage: -20° to 131° F (-29° to 55° C)
 - Reasonable rate of change with noncondensing relative humidity during the transition from warm to cold
- Relative humidity: 10% to 80%, noncondensing
- Altitude: 0 to 40,000 feet (0 to 12,192 meters)

Cooling Airflow Direction



NOTE: Because the front door of the enclosure must be adequately ventilated to allow air to enter the enclosure and the rear door must be adequately ventilated to allow air to escape, do not block the ventilation apertures of a NonStop BladeSystem.

Each NonStop BladeSystem includes 10 Active Cool fans that provide high-volume, high pressure airflow at even the slowest fan speeds. Air flow for each NonStop BladeSystem enters through a slot in the front of the c7000 enclosure and is pulled into the interconnect bays. Ducts allow the air to move from the front to the rear of the enclosure where it is pulled into the interconnects and the center plenum. The air is then exhausted out the rear of the enclosure.

Blanking Panels

If the NonStop BladeSystem is not completely filled with components, the gaps between these components can cause adverse changes in the airflow, negatively impacting cooling within the rack. You must cover any gaps with blanking panels. In high density environments, air gaps in the enclosure and between adjacent enclosures should be sealed to prevent recirculation of hot-air from the rear of the enclosure to the front.

Typical Acoustic Noise Emissions

70 dB(A) (sound pressure level at operator position)

Tested Electrostatic Immunity

- Contact discharge: 8 KV
- Air discharge: 20 KV

Calculating Specifications for Enclosure Combinations

Power and thermal calculations assume that each enclosure in the cabinet is fully populated. The power and heat load is less when enclosures are not fully populated, such as a Fibre Channel disk module with fewer disk drives.

AC current calculations assume that one PDU delivers all power. In normal operation, the power is split equally between the two PDUs in the cabinet. However, calculate the power load to assume delivery from only one PDU to allow the system to continue to operate if one of the two AC power sources or PDUs fails.

“Example of Cabinet Load Calculations” (page 52) lists the weight, power, and thermal calculations for a system with:

- One c7000 enclosure with 8 NonStop Server Blades
- Two IP or Storage CLIMs
- Two SAS disk enclosures
- One IOAM enclosure
- Two Fibre channel disk modules
- One rack-mounted system console with keyboard/monitor units
- One maintenance switch
- One 42U high cabinet

For a total thermal load for a system with multiple cabinets, add the heat outputs for all the cabinets in the system.

Table 3-1 Example of Cabinet Load Calculations

Component	Quantity	Height (U)	Weight		Total Volt-amps (VA) ¹		BTU/hour ²	
			(lbs)	(kg)	AC line(s) powered		AC line(s) powered	
					Single	Both	Single	Both
c7000 enclosure	1	10	480	218	4300	4400	12400	13700
IP or Storage CLIM	2	4	120	54	640	740	2140	2472
SAS disk enclosure	2	4	96	50	520	560	1738	1872
IOAM enclosure	1	11	235	106	262	326	893	1112
Fibre Channel disk module	2	6	156	70	580	696	1980	2374
Rack-mounted System Console (includes keyboard and monitor)	1	2	34	15	204	204	696	696
Maint. switch	1	1	6	3	44	44	150	150
Cabinet	1	42	303	137	-	-	-	-
Total	-	38	1430	653	6550	6970	19997	22376

- 1 Decrease the apparent power VA specification by 508VA for each empty NonStop Server Blade slot. For example, a c7000 that only has four NonStop Server Blades installed would be rated 4400 VA minus (4 server blades x 508 VA) = 2370 VA apparent power.
- 2 Decrease the BTU/hour specification by 1730 BTU/hour for each empty NonStop Server Blade slot. For example, a c7000 that only has four NonStop Server Blades installed would be rated 13700 BTU/hour minus (4 server blades x 1730 BTU/hour) = 6780 BTU/hour.

4 System Configuration Guidelines

This chapter provides configuration guidelines for a NonStop BladeSystem and includes these main topics:

- “Internal ServerNet Interconnect Cabling”
- “ServerNet Fabric and Supported Connections” (page 54)
- “NonStop BladeSystem Port Connections” (page 56)

NonStop BladeSystems use a flexible modular architecture. Therefore, various configurations of the system’s modular components are possible within configuration restrictions stated in this section and Chapter 5 (page 77).

Internal ServerNet Interconnect Cabling

This subsection includes:

- “Dedicated Service LAN Cables”
- “Length Restrictions for Optional Cables”
- “Cable Product IDs” (page 54)

Dedicated Service LAN Cables

The NonStop BladeSystem uses Category 5, unshielded twisted-pair Ethernet cables for the internal dedicated service LAN and for connections between the application LAN equipment and IP CLIM or IOAM enclosure.

Length Restrictions for Optional Cables



NOTE: For product IDs, see “Cable Types, Connectors, Lengths, and Product IDs” (page 93).

Maximum allowable lengths of optional cables connecting to components outside the modular cabinet are:

Connection	Fiber Type	Connectors	Maximum Length	Product ID
IOAM enclosure (Fibre Channel port) to ESS	MMF	LC-LC	250 m	M8900nn
IOAM enclosure (Fibre Channel port) to FC switch	MMF	LC-LC	250 m	M8900nn
Storage CLIM enclosure (Fibre Channel HBA) to FC tape	MMF	LC-LC	250 m	M8900nn
Storage CLIM enclosure (Fibre Channel HBA) to ESS	MMF	LC-LC	250 m	M8900nn
Storage CLIM enclosure (Fibre Channel HBA) to FC switch	MMF	LC-LC	250 m	M8900nn
Storage CLIM enclosure (SAS HBA) to SAS tape	N.A.	SFF-8470 to SFF-8088	6 m	M8905nn

Connection	Fiber Type	Connectors	Maximum Length	Product ID
Storage CLIM enclosure (SAS HBA) to SAS disk enclosure	N.A.	SFF-8470 to SFF-8088	6 m	M8905 ⁿⁿ
SAS disk enclosure to SAS disk enclosure	N.A.	SFF-8088 to SFF-8088	6 m	M8906 ⁿⁿ

Although a considerable cable length can exist between the modular enclosures in the system, HP recommends that cable length between each of the enclosures as short as possible.

Cable Product IDs

For product IDs, see “Cable Types, Connectors, Lengths, and Product IDs” (page 93)

ServerNet Fabric and Supported Connections

This subsection includes:

- “ServerNet Cluster Connections”
- “ServerNet Fabric Cross-Link Connections” (page 55)
- “Interconnections Between c7000 Enclosures” (page 55)
- “I/O Connections (Standard and High I/O ServerNet Switch Configurations)” (page 55)
- “Connections to IOAM Enclosures” (page 56)
- “Connections to CLIMs” (page 56)
- “ServerNet Fabric Cross-Link Connections” (page 55)

The ServerNet X and Y fabrics for the NonStop BladeSystem are provided by the double-wide ServerNet switch in the c7000 enclosure. Each c7000 enclosure requires two ServerNet switches for fault tolerance and each switch has four ServerNet connection groups:

- ServerNet Cluster Connections
- ServerNet Fabric Cross-Link Connections
- Interconnections between c7000 enclosures
- I/O Connections (Standard I/O and High I/O options)

The I/O connectivity to each of these groups is provided by one of two ServerNet switch options: either Standard I/O or High I/O.

ServerNet Cluster Connections

At J06.03, only standard ServerNet cluster connections via cluster switches using connections to both types of ServerNet-based cluster switches (6770 and 6780) is supported. There are two small form-factor pluggable (SFP) ports on each c7000 enclosure ServerNet switch: a single mode fiber (SMF) port (port 12) and a multi mode fiber (MMF) port (port 11) for the two ServerNet style connections. Only one of these ports can be used at a time and only one connection per fabric (from the appropriate ServerNet switch for that fabric in group 100) to the system's cluster fabric is supported.

ServerNet cluster connections on NonStop BladeSystems follow the ServerNet cluster and cable length rules and restrictions. For more information, see these manuals:

- *ServerNet Cluster Supplement for NonStop BladeSystems*
- For 6770 switches and star topologies: *ServerNet Cluster Manual*
- For 6780 switches and layered topology: *ServerNet Cluster 6780 Planning and Installation Guide*

ServerNet Fabric Cross-Link Connections

A pair of small form-factor pluggable (SFPs) with standard LC-Duplex connectors are provided to allow for the ServerNet fabric cross-link connection. Connections are made to ports 9 and 10 (labeled X1 and X2) on the c7000 enclosure ServerNet switch.

Interconnections Between c7000 Enclosures

A single c7000 enclosure can contain eight NonStop Server Blades. Two c7000 enclosures are interconnected to create a 16 processor system. These interconnections are provided by two quad optic ports — ports 1 and 2 (labeled GA and GB) located on the c7000 enclosure ServerNet switches in the 5 and 7 interconnect bays. The GA port on the first c7000 enclosure is connected to the GA port on the second c7000 enclosure (same fabric) and then likewise the GB port to the GB port. These connections provide eight Servernet cross-links between the two sets of eight NonStop processors and the ServerNet routers on the c7000 enclosure ServerNet switch.

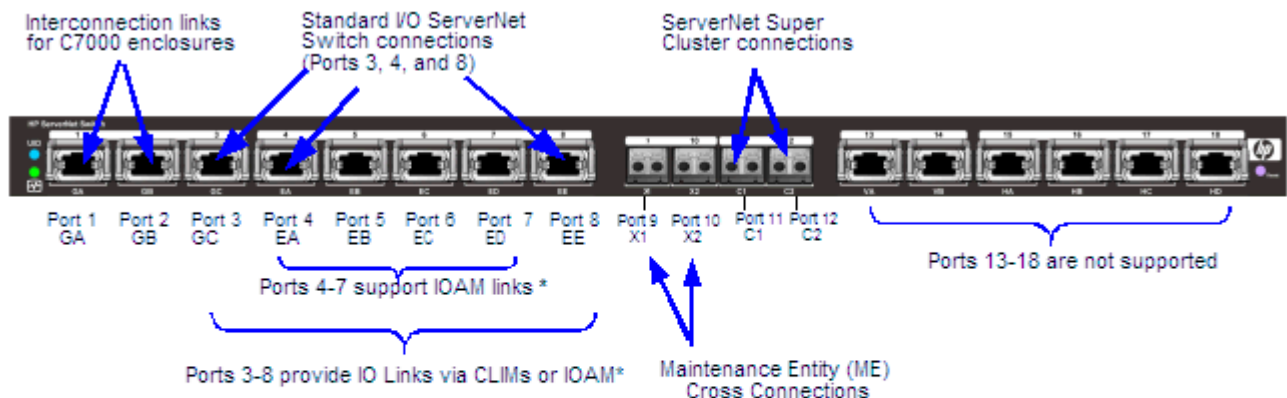
I/O Connections (Standard and High I/O ServerNet Switch Configurations)

There are two types of c7000 enclosure ServerNet switches: Standard I/O and High I/O. Each pair of ServerNet switches in a c7000 enclosure must be identical, either Standard I/O or High I/O. However, you can mix ServerNet switches between enclosures.

The main difference between the Standard I/O or High I/O switches is the number and type of quad optics modules that are installed for I/O connectivity.

The Standard I/O ServerNet switch has three quad optic modules: ports 3, 4, and 8 (labeled GC, EA, and EE) for a total of 12 Servernet links as shown following:

Figure 4-1 ServerNet Switch Standard I/O Supported Connections

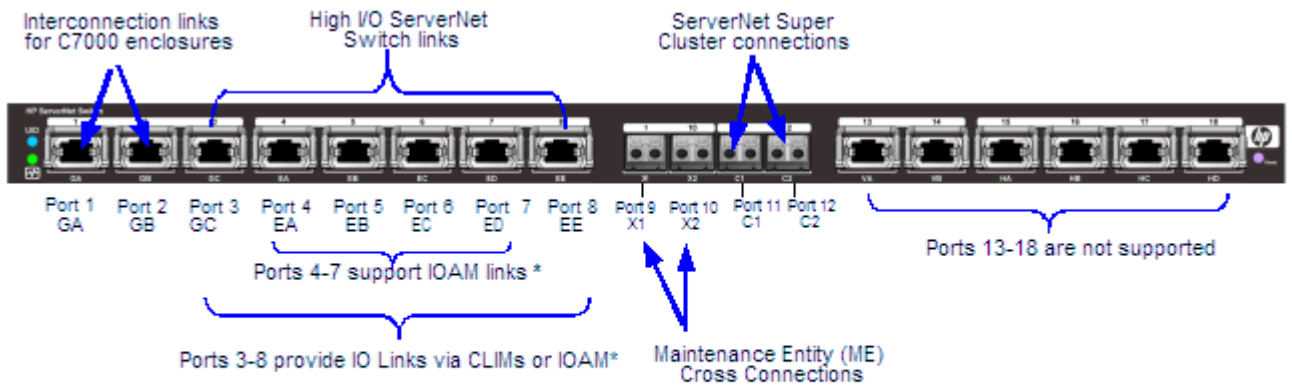


* IOAM enclosures require 4-way ServerNet connections, which are only supported on ports 4-7.

VST728.vsd

The High I/O ServerNet switch has six quad optic modules — ports 3, 4, 5, 6, 7, and 8 (labelled GC, EA, EB, EC, and ED) for a total of 24 Servernet links as shown following. If both c7000 enclosures in a 16 processor system contain High I/O ServerNet switches, there are a total of 48 ServerNet connections for I/O.

Figure 4-2 ServerNet Switch High I/O Supported Connections



* IOAM enclosures require 4-way ServerNet connections, which are only supported on ports 4-7.

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Connections to IOAM Enclosures

The NonStop BladeSystem supports connections to an IOAM Enclosure. The IOAM Enclosure requires 4-way ServerNet links. If you want 4 IOAMs in the first enclosure, only the ServerNet High I/O Switch provides these number of connections, which are available on quad optic ports 4, 5, 6, and 7 (labelled EA, EB, EC, and ED) as illustrated in Figure 4-2.

The NonStop BladeSystem supports a maximum of six IOAMs in a NonStop BladeSystem system with 16 processors. For a 16 processor system, the connection points are asymmetrical between the ServerNet Switches. Only ports EA and EC support connections to an IOAM enclosures on the second ServerNet switch. For the Standard I/O ServerNet switch, only one IOAM module can be attached per c7000 enclosure. Additionally, if a Standard I/O ServerNet switch is used for the first c7000 enclosure for one IOAM enclosure, then the second c7000 enclosure only supports one more IOAM enclosure regardless of the type of ServerNet switch (Standard I/O or High I/O).

Connections to CLIMs

The NonStop BladeSystem supports a maximum of 24 CLIM modules per system. A CLIM uses either one or two ServerNet connections to a fabric. The Storage CLIM typically uses two connections per fabric to achieve high disk performance. The IP CLIM typically uses one connection per ServerNet fabric. For I/O connections, a breakout cable is used on the back panel of the c7000 enclosure ServerNet switch to convert to standard LC-Duplex style connections.

NonStop BladeSystem Port Connections

This subsection includes:

- “Fibre Channel Ports to Fibre Channel Disk Modules”
- “Fibre Channel Ports to Fibre Tape Devices” (page 57)
- “SAS Ports to SAS Disk Enclosures” (page 57)
- “SAS Ports to SAS Tape Devices” (page 57)

Fibre Channel Ports to Fibre Channel Disk Modules

Fibre Channel disk modules (FCDMs) can only be connected to the FCSA in an IOAM enclosure. FCDMs are directly connected to the Fibre Channel ports on an IOAM enclosure with this exception:

Up to four FCDMs (or up to four daisy-chained configurations with each daisy-chain configuration containing 4 FCDMs) can be connected to the FCSA ports on an IOAM enclosure in a NonStop Blades System.

Fibre Channel Ports to Fibre Tape Devices

Fibre Channel tape devices can be directly connected to the Fibre Channel ports on a Storage CLIM or an FCSA in an IOAM enclosure. With a Fibre Channel tape drive connected to the system, you can use the BACKUP and RESTORE utilities to save data to and restore data from tape.

SAS Ports to SAS Disk Enclosures

SAS disk enclosures can be connected directly to the two HBA SAS ports on a Storage CLIM with this exception:

Daisy-chain configurations are not supported.

SAS Ports to SAS Tape Devices

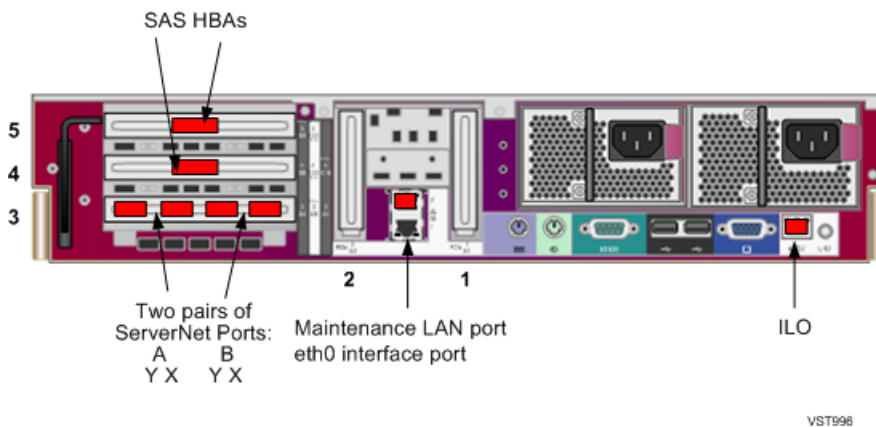
SAS tape devices have one SAS port that can be directly connected to the HBA SAS port on a Storage CLIM. Each SAS tape enclosure supports two tape drives. With a SAS tape drive connected to the system, you can use the BACKUP and RESTORE utilities to save data to and restore data from tape.

Storage CLIM Devices

This subsection includes:

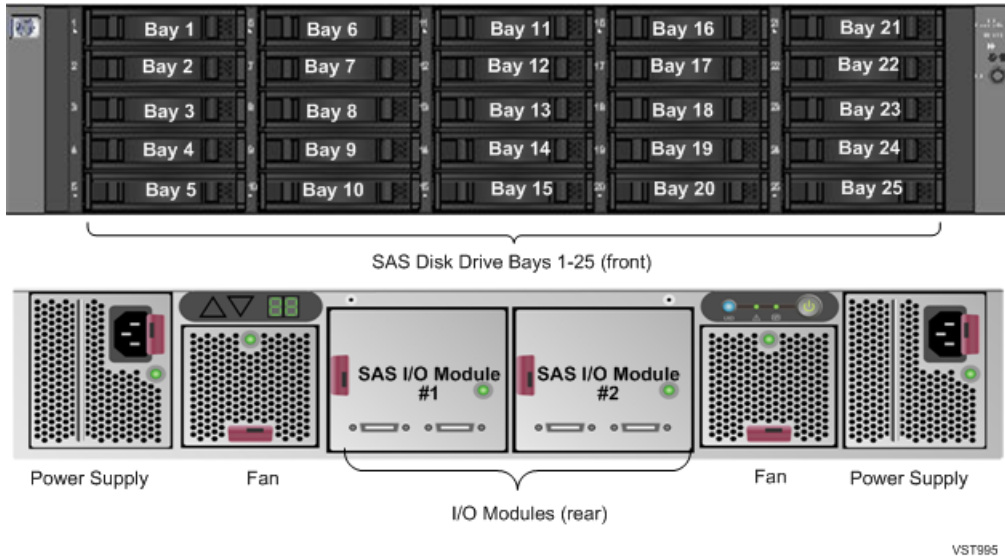
- “Factory-Default Disk Volume Locations for SAS Disk Devices” (page 58)
- “Configuration Restrictions for Storage CLIMs” (page 58)
- “Configurations for Storage CLIM and SAS Disk Enclosures” (page 58)

The NonStop BladeSystem uses the rack-mounted SAS disk enclosure and its SAS disk drives are controlled through the Storage CLIM. This illustration shows the ports on a Storage CLIM:



NOTE: Both the Storage and IP CLIMs use the Cluster I/O Protocols (CIP) subsystem. For more information about the CIP subsystem, see the *Cluster I/O Protocols Configuration and Management Manual*.

This illustration shows the locations of the hardware in the SAS disk enclosure as well as the I/O modules on the rear of the enclosure for connecting to the Storage CLIM.



SAS disk enclosures connect to Storage CLIMs via SAS cables. For details on cable types, see “Cable Types, Connectors, Lengths, and Product IDs” (page 93).

Factory-Default Disk Volume Locations for SAS Disk Devices

This illustration shows where the factory-default locations for the primary and mirror system disk volumes reside in separate disk enclosures:



Configuration Restrictions for Storage CLIMs

The maximum number of logical unit numbers (LUNs) for each CLIM, including SAS disks, ESS and tapes is 512. Each primary, backup, mirror and mirror backup path is counted in this maximum.

Use only the supported configurations as described below.

Configurations for Storage CLIM and SAS Disk Enclosures

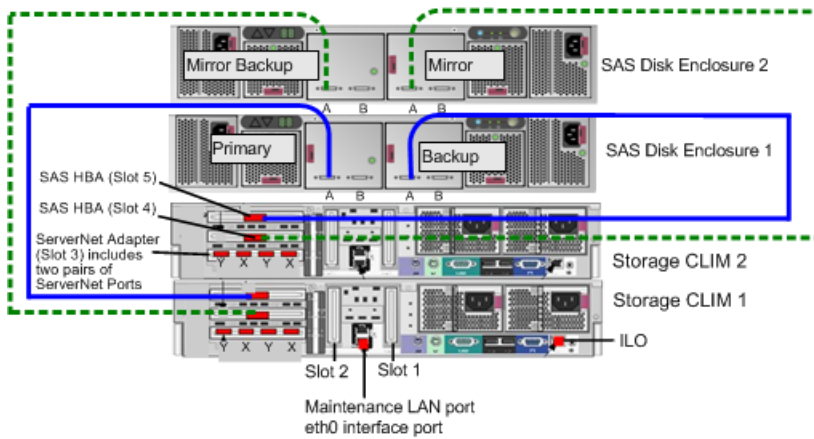
These subsections show the supported configurations for SAS Disk enclosures with Storage CLIMs:

- “Two Storage CLIMs, Two SAS Disk Enclosures” (page 58)
- “Two Storage CLIMs, Four SAS Disk Enclosures” (page 59)

Two Storage CLIMs, Two SAS Disk Enclosures

This illustration shows example cable connections between the two Storage CLIM, two SAS disk enclosure configuration:

Figure 4-3 Two Storage CLIMs, Two SAS Disk Enclosure Configuration



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This table lists the Storage CLIM, LUN, and bay identification for the factory-default system disk locations in the configuration of two Storage CLIMs and two SAS disk enclosures. In this case, \$SYSTEM, \$DSMSCM, \$AUDIT, and OSS are configured as mirrored SAS disk volumes:

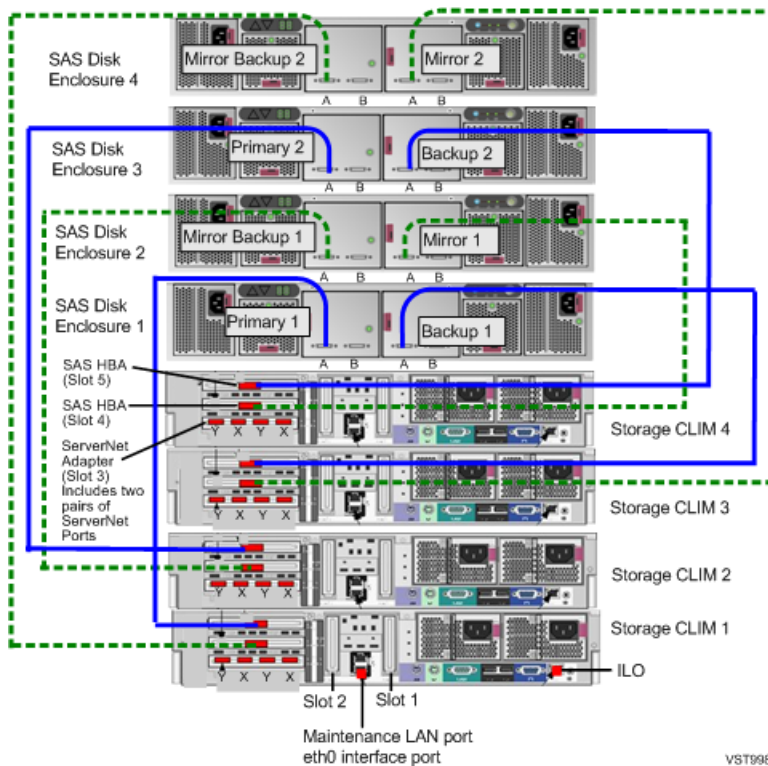
Disk Volume Name	Primary and Mirror-Backup CLIM	Backup and Mirror CLIM
\$SYSTEM	100.2.5.3.1	100.2.5.3.3
\$DSMSCM	100.2.5.3.1	100.2.5.3.3
\$AUDIT	100.2.5.3.1	100.2.5.3.3
\$OSS	100.2.5.3.1	100.2.5.3.3

* For an illustration of the factory-default slot locations for a SAS disk enclosure, see “Factory-Default Disk Volume Locations for SAS Disk Devices” (page 58).

Two Storage CLIMs, Four SAS Disk Enclosures

This illustration shows example cable connections for the two Storage CLIM, four SAS disk enclosures configuration:

Figure 4-4 Two Storage CLIMs, Four SAS Disk Enclosure Configuration



This table lists the Storage CLIM, LUN, and bay identification for the factory-default system disk locations in the configuration of two Storage CLIMs and four SAS disk enclosures. In this case, \$SYSTEM, \$DSMSCM, \$AUDIT, and OSS are configured as mirrored SAS disk volumes:

Disk Volume Name	Primary CLIM	Backup CLIM	Mirror CLIM	Mirror-Backup CLIM	Primary LUN	Mirror LUN	Primary Disk Bay in Primary SAS Enclosure	Mirror Disk Location in Mirror SAS Enclosure
\$SYSTEM	100.2.5.3.1	100.2.5.4.1	100.2.5.4.3	100.2.5.3.3	101	101	1	1
\$DSMSCM	100.2.5.3.1	100.2.5.4.1	100.2.5.4.3	100.2.5.3.3	102	102	2	2
\$AUDIT	100.2.5.3.1	100.2.5.4.1	100.2.5.4.3	100.2.5.3.3	103	103	3	3
\$OSS	100.2.5.3.1	100.2.5.4.1	100.2.5.4.3	100.2.5.3.3	104	104	4	4

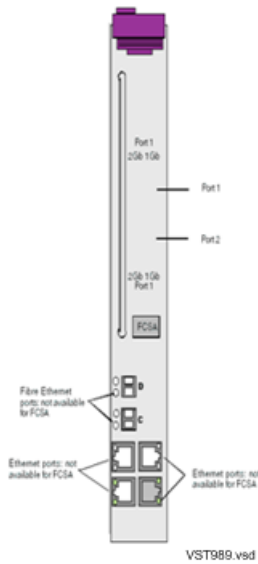
Fibre Channel Devices

This subsection describes Fibre Channel devices and covers these topics:

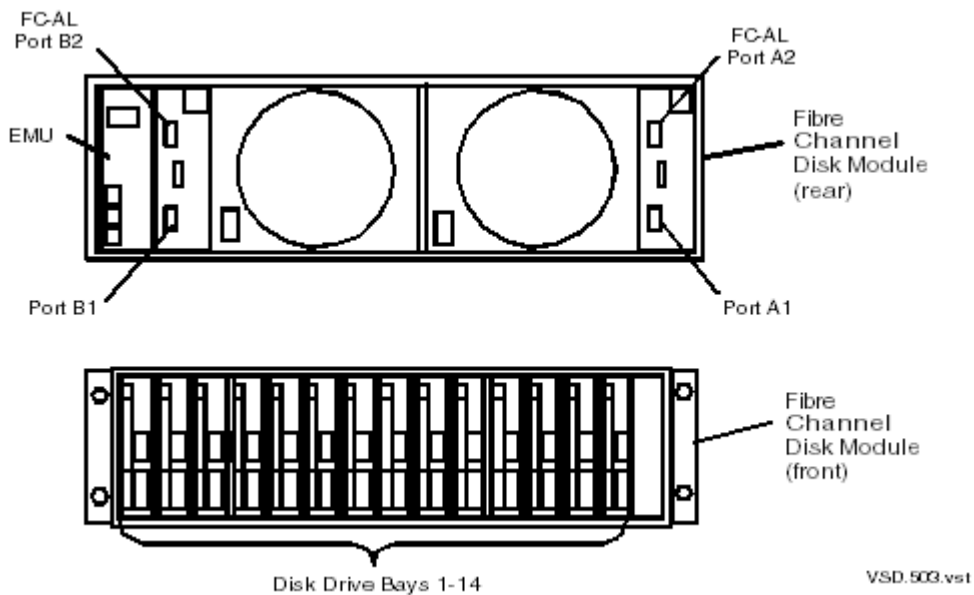
- “Factory-Default Disk Volume Locations for FCDMs” (page 61)
- “Configurations for Fibre Channel Devices” (page 62)
- “Configuration Restrictions for Fibre Channel Devices” (page 62)
- “Recommendations for Fibre Channel Device Configuration” (page 62)
- “Example Configurations of the IOAM Enclosure and Fibre Channel Disk Module” (page 63)

The rack-mounted Fibre Channel disk module (FCDM) can only be used with NonStop BladeSystems that have IOAM enclosures. An FCDM and its disk drives are controlled through the Fibre Channel ServerNet adapter (FCSA). For more information on the FCSA, see the *Fibre-Channel ServerNet Adapter Installation and Support Guide*. For more information on the Fibre Channel disk module (FCDM), see “Fibre Channel Disk Module (FCDM)” (page 20). For examples of cable connections between FCSAs and FCDMs, see “Example Configurations of the IOAM Enclosure and Fibre Channel Disk Module” (page 63).

This illustration shows an FCSA with indicators and ports:



This illustration shows the locations of the hardware in the Fibre Channel disk module as well as the Fibre Channel port connectors at the back of the enclosure:

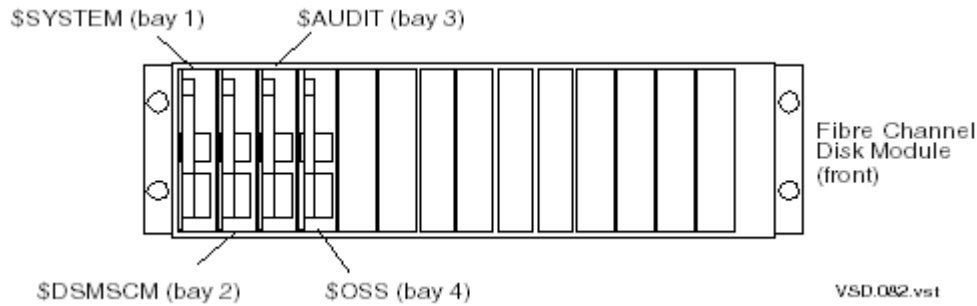


Fibre Channel disk modules connect to Fibre Channel ServerNet adapters (FCSAs) via Fiber Channel arbitrated loop (FC-AL) cables. This drawing shows the two Fibre Channel arbitrated loops implemented within the Fibre Channel disk module:



Factory-Default Disk Volume Locations for FCDMs

This illustration shows where the factory-default locations for the primary and mirror system disk volumes reside in separate Fibre Channel disk modules:



FCSA location and cable connections vary according to the various controller and Fibre Channel disk module combinations.

Configurations for Fibre Channel Devices

Storage subsystems in NonStop S-series systems used a fixed hardware layout. Each enclosure can have up to four controllers for storage devices and up to 16 internal disk drives. The controllers and disk drives always have a fixed logical location with standardized location IDs of group-module-slot. Only the group number changes as determined by the enclosure position in the ServerNet topology.

However, the NonStop BladeSystems have no fixed boundaries for the Fibre Channel hardware layout. Up to 60 FCSA (or 120 ServerNet addressable controllers) and 240 Fibre Channel disk enclosures, with identification depending on the ServerNet connection of the IOAM and slot housing in the FCSAs.

Configuration Restrictions for Fibre Channel Devices

These configuration restrictions apply and are invoked by Subsystem Control Facility (SCF):

- Primary and mirror disk drives cannot connect to the same Fibre Channel loop. Loss of the Fibre Channel loop makes both the primary volume and the mirrored volume inaccessible. This configuration inhibits fault tolerance.

Disk drives in different Fibre Channel disk modules on a daisy chain connect to the same Fibre Channel loop.

- The primary path and backup Fibre Channel communication links to a disk drive should not connect to FCSAs in the same module of an IOAM enclosure. In a fully populated system, loss of one FCSA can make up to 56 disk drives inaccessible on a single Fibre Channel communications path. This configuration is allowed, but only if you override an SCF warning message.
- The mirror path and mirror backup Fibre Channel communication links to a disk drive should not connect to FCSAs in the same module of an IOAM enclosure. In a fully populated system, loss of one FCSA can make up to 56 disk drives inaccessible on a single Fibre Channel communications path. This configuration is allowed, but only if you override an SCF warning message.

Recommendations for Fibre Channel Device Configuration

These recommendations apply to FCSA and Fibre Channel disk module configurations:

- Primary Fibre Channel disk module connects to the FCSA F-SAC 1.
- Mirror Fibre Channel disk module connects to the FCSA F-SAC 2.
- FC-AL port A1 is the incoming port from an FCSA or from another Fibre Channel disk module.
- FC-AL port A2 is the outbound port to another Fibre Channel disk module.
- FC-AL port B2 is the incoming port from an FCSA or from a Fibre Channel disk module.

- FC-AL port B1 is the outbound port to another Fibre Channel disk module
- In a daisy-chain configuration, the ID expander harness determines the enclosure number. Enclosure 1 is always at the bottom of the chain.
- FCSAs can be installed in slots 1 through 5 in an IOAM.
- G4SAs can be installed in slots 1 through 5 in an IOAM.
- In systems with two or more cabinets, primary and mirror Fibre Channel disk modules reside in separate cabinets to prevent application or system outage if a power outage affects one cabinet.
- With primary and mirror Fibre Channel disk modules in the same cabinet, the primary Fibre Channel disk module resides in a lower U than the mirror Fibre Channel disk module.
- Fibre Channel disk drives are configured with dual paths.
- Where possible, FCSAs and Fibre Channel disk modules are configured with four FCSAs and four Fibre Channel disk modules for maximum fault tolerance. If FCSAs are not in groups of four, the remaining FCSAs and Fibre Channel disk modules can be configured in other fault-tolerant configurations such as with two FCSAs and two Fibre Channel disk modules or four FCSAs and three Fibre Channel disk modules.
- In systems with one IOAM enclosure:
 - With two FCSAs and two Fibre Channel disk modules, the primary FCSA resides in module 2 of the IOAM enclosure, and the backup FCSA resides in module 3. (See the example configuration in “Two FCSAs, Two FCDMs, One IOAM Enclosure” (page 64).)
 - With four FCSAs and four Fibre Channel disk modules, FCSA 1 and FCSA 2 reside in module 2 of the IOAM enclosure, and FCSA 3 and FCSA 4 reside in module 3. (See the example configuration in “Four FCSAs, Four FCDMs, One IOAM Enclosure” (page 64).)
- In systems with two or more IOAM enclosures
 - With two FCSAs and two Fibre Channel disk modules, the primary FCSA resides in IOAM enclosure 1, and the backup FCSA resides in IOAM enclosure 2. (See the example configuration in “Two FCSAs, Two FCDMs, Two IOAM Enclosures” (page 65).)
 - With four FCSAs and four Fibre Channel disk modules, FCSA 1 and FCSA 2 reside in IOAM enclosure 1, and FCSA 3 and FCSA 4 reside in IOAM enclosure 2. (See the example configuration in “Four FCSAs, Four FCDMs, Two IOAM Enclosures” (page 66).)
- Daisy-chain configurations follow the same configuration restrictions and rules that apply to configurations that are not daisy-chained. (See “Daisy-Chain Configurations” (page 67).)
- Fibre Channel disk modules containing mirrored volumes must be installed in separate daisy chains.
- Daisy-chained configurations require that all Fibre Channel disk modules reside in the same cabinet and be physically grouped together.
- Daisy-chain configurations require an ID expander harness with terminators for proper Fibre Channel disk module and disk drive identification.
- After you connect all Fibre Channel disk modules in configurations of four FCSAs and four Fibre Channel disk modules, yet three Fibre Channel disk modules remain not connected, connect them to the four FCSAs. (See the example configuration in “Four FCSAs, Three FCDMs, One IOAM Enclosure” (page 69).)

Example Configurations of the IOAM Enclosure and Fibre Channel Disk Module

These subsections show various example configurations of FCSA controllers and Fibre Channel disk modules with IOAM enclosures.



NOTE: Although it is not a requirement for fault tolerance to house the primary and mirror disk drives in separate FCDMs, the example configurations show FCDMs housing only primary or mirror drives, mainly for simplicity in keeping track of the physical locations of the drives.

- “Two FCSAs, Two FCDMs, One IOAM Enclosure”
- “Four FCSAs, Four FCDMs, One IOAM Enclosure”
- “Two FCSAs, Two FCDMs, Two IOAM Enclosures” (page 65)
- “Four FCSAs, Four FCDMs, Two IOAM Enclosures” (page 66)
- “Daisy-Chain Configurations” (page 67)
- “Four FCSAs, Three FCDMs, One IOAM Enclosure” (page 69)

Two FCSAs, Two FCDMs, One IOAM Enclosure

This illustration shows example cable connections between the two FCSAs and the primary and mirror Fibre Channel disk modules:

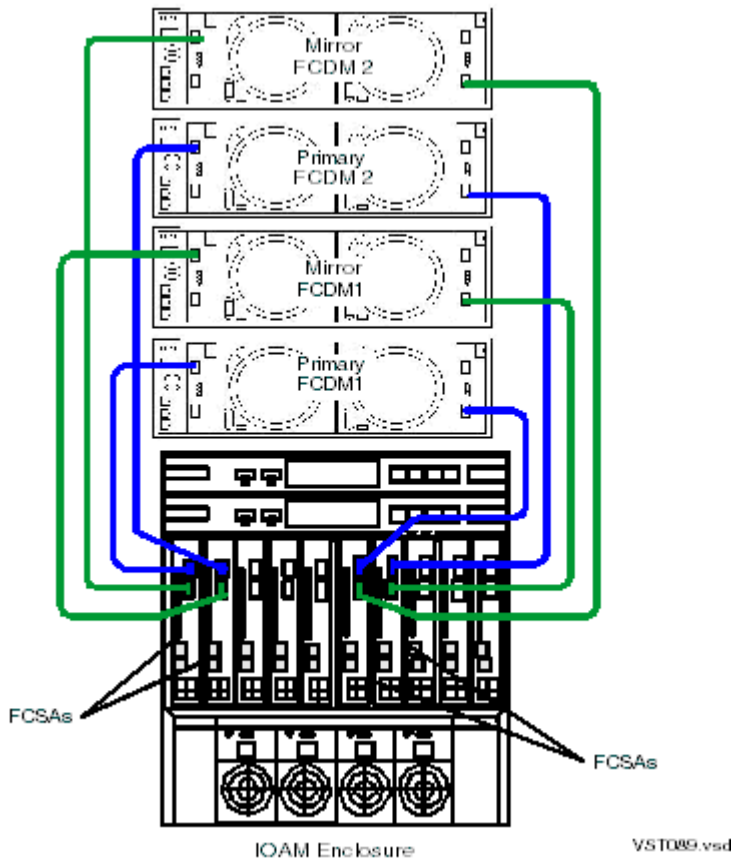
This table lists the FCSA group-module-slot-port (GMSP) and disk group-module-shelf-bay (GMSB) identification for the factory-default system disk locations in the configuration of four FCSAs, two Fibre Channel disk modules, and one IOAM enclosure:

Disk Volume Name	FCSA GMSP	Disk GMSB*
\$SYSTEM (primary)	110.2.1.1 and 110.3.1.1	110.211.101
\$DSMSCM (primary)	110.2.1.1 and 110.3.1.1	110.211.102
\$AUDIT (primary)	110.2.1.1 and 110.3.1.1	110.211.103
\$OSS (primary)	110.2.1.1 and 110.3.1.1	110.211.104
\$SYSTEM (mirror)	110.2.1.2 and 110.3.1.2	110.212.101
\$DSMSCM (mirror)	110.2.1.2 and 110.3.1.2	110.212.102
\$AUDIT (mirror)	110.2.1.2 and 110.3.1.2	110.212.103
\$OSS (mirror)	110.2.1.2 and 110.3.1.2	110.212.104

* For an illustration of the factory-default slot locations for a Fibre Channel disk module, see “Factory-Default Disk Volume Locations for FCDMs” (page 61).

Four FCSAs, Four FCDMs, One IOAM Enclosure

This illustration shows example cable connections between the four FCSAs and the two sets of primary and mirror Fibre Channel disk modules:



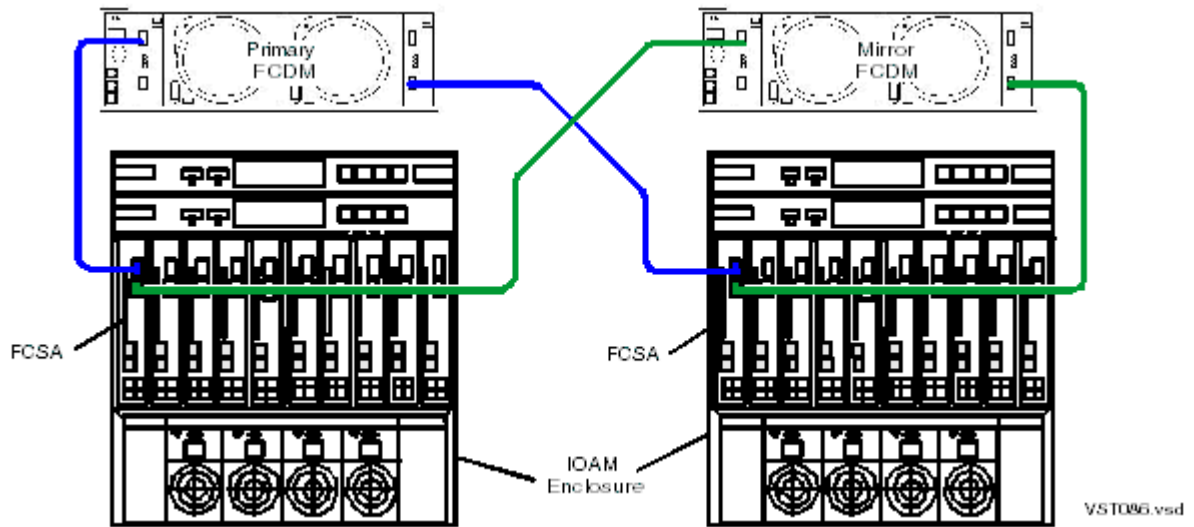
This table lists the FCSA group-module-slot-port (GMSP) and disk group-module-shelf-bay (GMSB) identification for the factory-default system disk locations in the configuration of four FCSAs, four Fibre Channel disk modules, and one IOAM enclosure:

Disk Volume Name	FCSA GMSP	Disk GMSB ¹
\$SYSTEM (primary 1)	110.2.1.1 and 110.3.1.1	110.211.101
\$DSMSCM (primary 1)	110.2.1.1 and 110.3.1.1	110.211.102
\$AUDIT (primary 1)	110.2.1.1 and 110.3.1.1	110.211.103
\$OSS (primary 1)	110.2.1.1 and 110.3.1.1	110.211.104
\$SYSTEM (mirror 1)	110.2.1.2 and 110.3.1.2	110.212.101
\$DSMSCM (mirror 1)	110.2.1.2 and 110.3.1.2	110.212.102
\$AUDIT (mirror 1)	110.2.1.2 and 110.3.1.2	110.212.103
\$OSS (mirror 1)	110.2.1.2 and 110.3.1.2	110.212.104

¹ For an illustration of the factory-default slot locations for a Fibre Channel disk module, see “Factory-Default Disk Volume Locations for FCDMs” (page 61).

Two FCSAs, Two FCDMs, Two IOAM Enclosures

This illustration shows example cable connections between the two FCSAs split between two IOAM enclosures and one set of primary and mirror Fibre Channel disk modules:



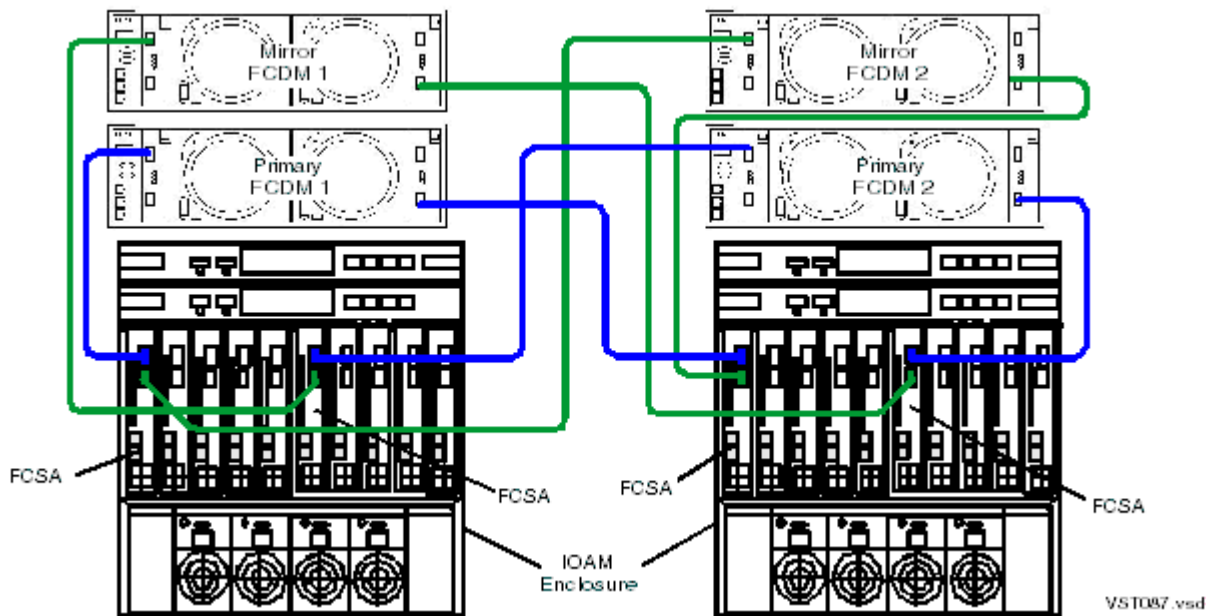
This table lists the FCSA group-module-slot-port (GMSP) and disk group-module-shelf-bay (GMSB) identification for the factory-default system disk locations in the configuration of two FCSAs, two Fibre Channel disk modules, and two IOAM enclosures:

Disk Volume Name	FCSA GMSP	Disk GMSB ¹
\$SYSTEM (primary 1)	110.2.1.1 and 111.2.1.1	110.211.101
\$DSMSCM (primary 1)	110.2.1.1 and 111.2.1.1	110.211.102
\$AUDIT (primary 1)	110.2.1.1 and 111.2.1.1	110.211.103
\$OSS (primary 1)	110.2.1.1 and 111.2.1.1	110.211.104
\$SYSTEM (mirror 1)	110.2.1.2 and 111.2.1.2	110.212.101
\$DSMSCM (mirror 1)	110.2.1.2 and 111.2.1.2	110.212.102
\$AUDIT (mirror 1)	110.2.1.2 and 111.2.1.2	110.212.103
\$OSS (mirror 1)	110.2.1.2 and 111.2.1.2	110.212.104

¹ For an illustration of the factory-default slot locations for a Fibre Channel disk module, see "Factory-Default Disk Volume Locations for FCDMs" (page 61).

Four FCSAs, Four FCDMs, Two IOAM Enclosures

This illustration shows example cable connections between the four FCSAs split between two IOAM enclosures and two sets of primary and mirror Fibre Channel disk modules:



This table lists the FCSA group-module-slot-port (GMSP) and disk group-module-shelf-bay (GMSB) identification for the factory-default system disk locations in the configuration of four FCSAs, four Fibre Channel disk modules, and two IOAM enclosures:

Disk Volume Name	FCSA GMSP	Disk GMSB*
\$SYSTEM (primary)	110.2.1.1 and 111.2.1.1	110.211.101
\$DSMSCM (primary)	110.2.1.1 and 111.2.1.1	110.211.102
\$AUDIT (primary)	110.2.1.1 and 111.2.1.1	110.211.103
\$OSS (primary)	110.2.1.1 and 111.2.1.1	110.211.104
\$SYSTEM (mirror)	110.2.1.2 and 111.2.1.2	110.212.101
\$DSMSCM (mirror)	110.2.1.2 and 111.2.1.2	110.212.102
\$AUDIT (mirror)	110.2.1.2 and 111.2.1.2	110.212.103
\$OSS (mirror)	110.2.1.2 and 111.2.1.2	110.212.104

* For an illustration of the factory-default slot locations for a Fibre Channel disk module, see "Factory-Default Disk Volume Locations for FCDMs" (page 61)

Daisy-Chain Configurations

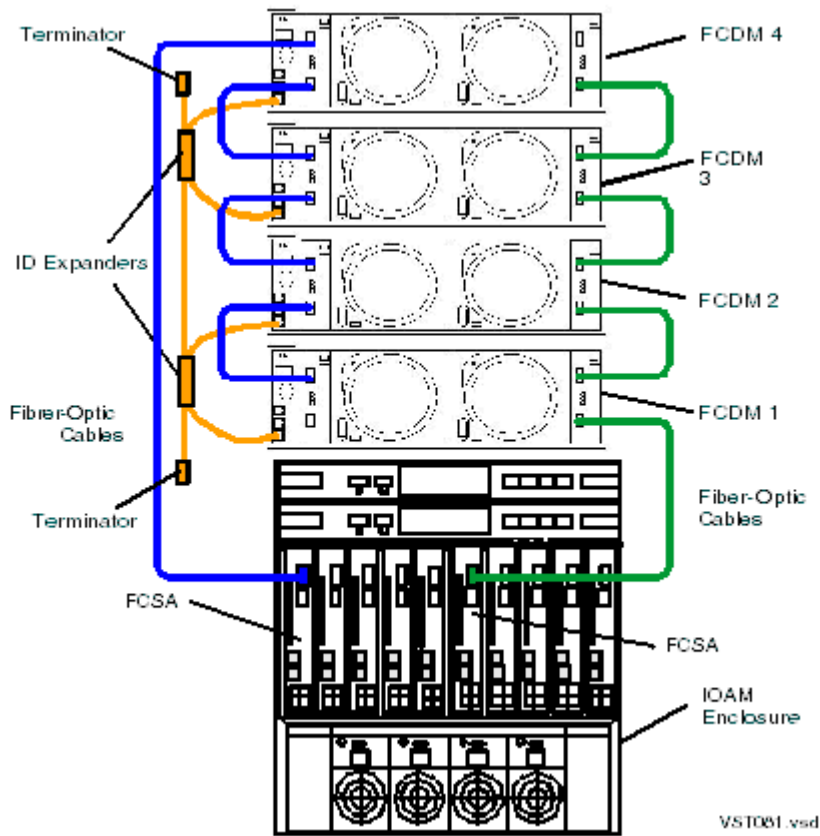
When planning for possible use of daisy-chained disks, consider:

Daisy-Chained Disks Recommended	Daisy-Chained Disks Not Recommended	Requirements for Daisy-Chain ¹
Cost-sensitive storage and applications using low-bandwidth disk I/O.	Many volumes in a large Fibre Channel loop. The more volumes that exist in a larger loop, the higher the potential for negative impact from a failure that takes down a Fibre Channel loop.	All daisy-chained Fibre Channel disk modules reside in the same cabinet and are physically grouped together.
Low-cost, high-capacity data storage is important.	Applications with a highly mixed workload, such as transaction data bases or applications with high disk I/O.	ID expander harness with terminators is installed for proper Fibre Channel disk module and drive identification.

Daisy-Chained Disks Recommended	Daisy-Chained Disks Not Recommended	Requirements for Daisy-Chain ¹
		FCSA for each Fibre Channel loop is installed in a different IOAM module for fault tolerance.
		Two Fibre Channel disk modules minimum, with four Fibre Channel disk modules maximum per daisy chain.

1 See "Fibre Channel Devices" (page 60).

This illustration shows an example of cable connections between the two FCSAs and four Fibre Channel disk modules in a single daisy-chain configuration:



A second equivalent configuration, including an IOAM enclosure, two FCSAs, four Fibre Channel disk modules with an ID expander, is required for fault-tolerant mirrored disk storage. Installing each mirrored disk in the same corresponding FCDM and bay number as its primary disk is not required, but it is recommended to simplify the physical management and identification of the disks.

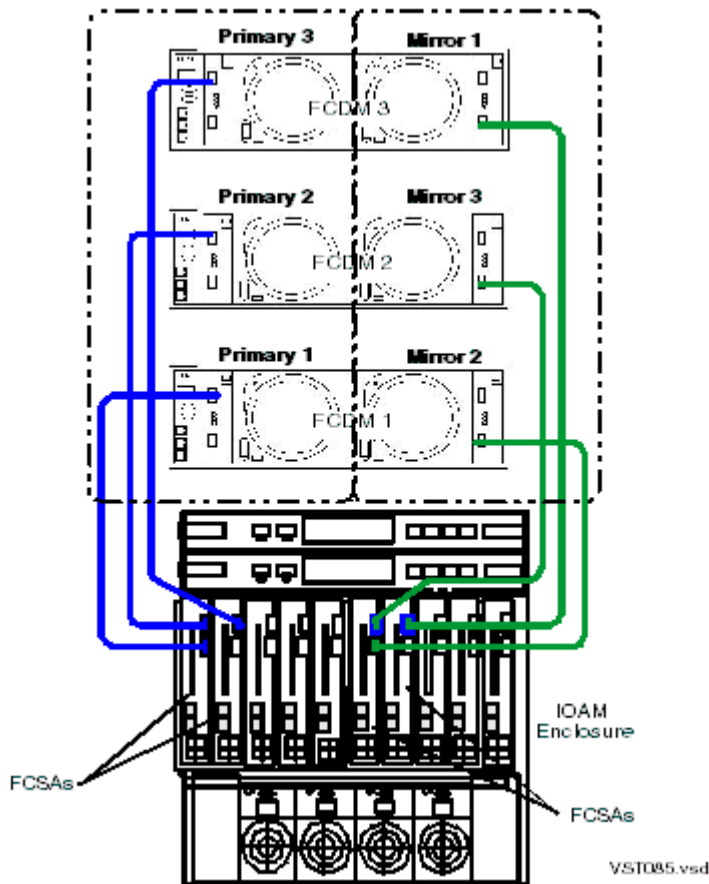
This table lists the FCSA group-module-slot-port (GMSP) and disk group-module-shelf-bay (GMSB) identification for the factory-default system disk locations in a daisy-chained configuration:

Disk Volume Name	FCSA GMSP	Disk GMSB*
\$SYSTEM	110.2.1.1 and 110.3.1.1	110.211.101
\$DSMSCM	110.2.1.1 and 110.3.1.1	110.211.102
\$AUDIT	110.2.1.1 and 110.3.1.1	110.211.103

Disk Volume Name	FCSA GMSP	Disk GMSB*
\$OSS	110.2.1.1 and 110.3.1.1	110.211.104
* For an illustration of the factory-default slot locations for a Fibre Channel disk module, see “Factory-Default Disk Volume Locations for FCDMs” (page 61).		

Four FCSAs, Three FCDMs, One IOAM Enclosure

This illustration shows example cable connections between the four FCSAs and three Fibre Channel disk modules with the primary and mirror drives split within each Fibre Channel disk module:

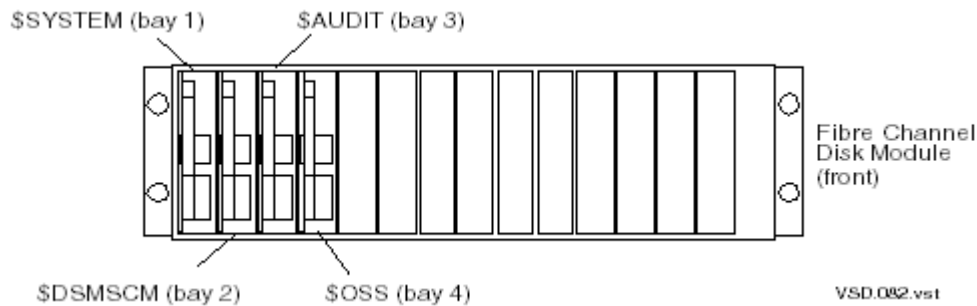


This table lists the FCSA group-module-slot-port (GMSP) and disk group-module-shelf-bay (GMSB) identification for the factory-default disk volumes for the configuration of four FCSAs, three Fibre Channel disk modules, and one IOAM enclosure:

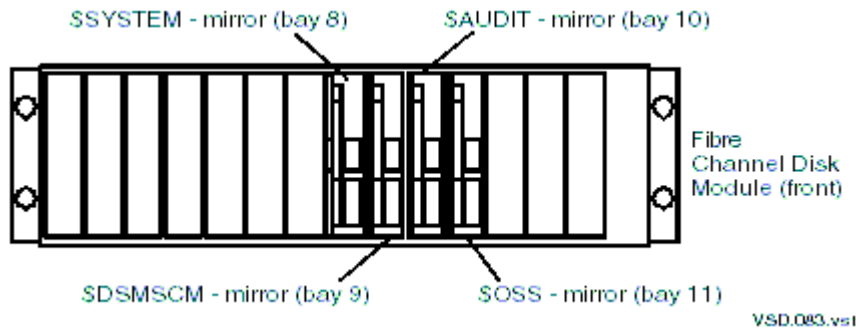
Disk Volume Name	FCSA GMSP	Disk GMSB
\$SYSTEM (primary 1)	110.2.1.2 and 110.3.1.2	110.212.101
\$DSMSCM (primary 1)	110.2.1.2 and 110.3.1.2	110.212.101
\$AUDIT (primary 1)	110.2.1.2 and 110.3.1.2	110.212.101
\$OSS (primary 1)	110.2.1.2 and 110.3.1.2	110.212.101
\$SYSTEM (mirror 1)	110.2.2.1 and 110.3.2.1	110.221.108
\$DSMSCM (mirror 1)	110.2.2.1 and 110.3.2.1	110.221.109

Disk Volume Name	FCSA GMSP	Disk GMSB
\$AUDIT (mirror 1)	110.2.2.1 and 110.3.2.1	110.221.110
\$OSS (mirror 1)	110.2.2.1 and 110.3.2.1	110.221.111

This illustration shows the factory-default locations for the configurations of four FCSAs and three Fibre Channel disk modules where the primary system file disk volumes are in Fibre Channel disk module 1:



This illustration shows the factory-default locations for the configurations of four FCSAs with three Fibre Channel disk modules where the mirror system file disk volumes are in Fibre Channel disk module 3:



Ethernet to Networks

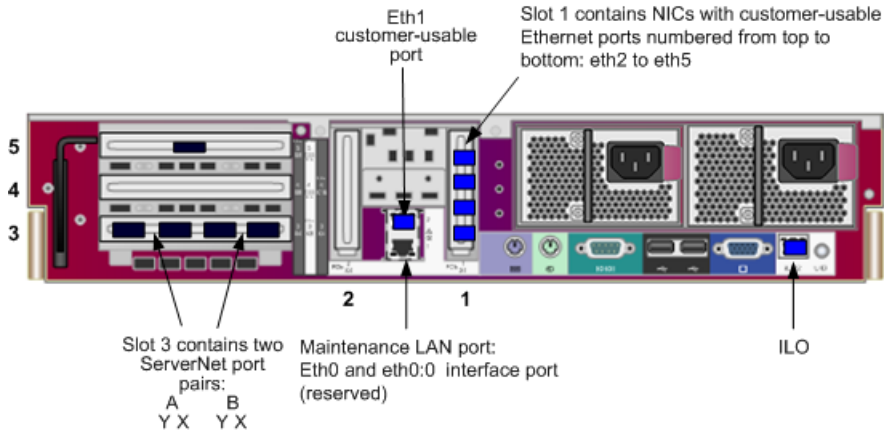
Depending on your configuration, the Ethernet ports in an IP CLIM or a G4SA installed in an IOAM enclosure provide Gigabit connectivity between NonStop BladeSystems and Ethernet LANs. The Ethernet port is an end node on the ServerNet and uses either fiber-optic or copper cable for connectivity to user application LANs, as well as for the dedicated service LAN.

For information on the Ethernet ports on a G4SA installed in an IOAM enclosure, see the *Gigabit Ethernet 4-Port Adapter (G4SA) Installation and Support Guide*.

The IP CLIM has two types of Ethernet configurations: IP CLIM A and IP CLIM B.

This illustration shows the Ethernet ports and ServerNet fabric connections on an IP CLIM with the IP CLIM A configuration:

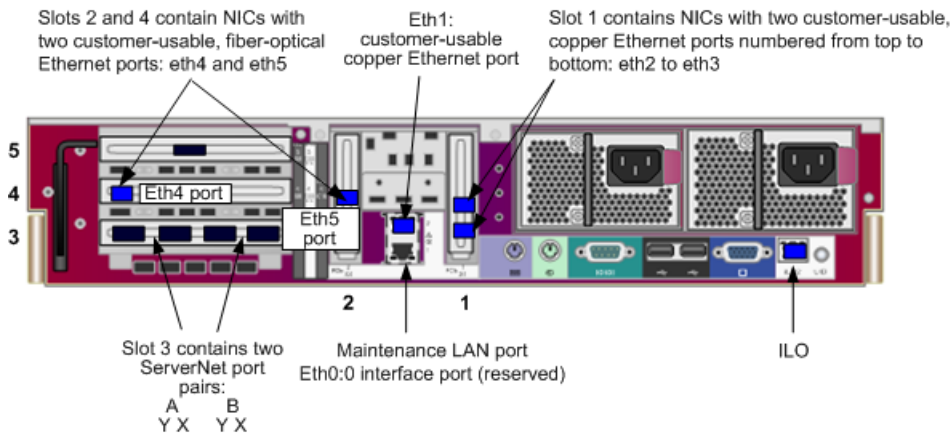
IP CLIM - Configuration A
5 Ethernet Ports – All Copper



VSTB00

This illustration shows the Ethernet ports and ServerNet fabric connections on an IP CLIM with the IP CLIM B configuration:

IP CLIM - Configuration B
5 Ethernet Ports – 3 Copper/2 Fiber



VSTB01

Both the IP and Storage CLIMs use the Cluster I/O Protocols (CIP) subsystem. For more information about managing your CLIMs using the CIP subsystem, see the *Cluster I/O Protocols Configuration and Management Manual*.

Managing NonStop BladeSystem Resources

This subsection provides procedures and information for managing your NonStop BladeSystem resources and includes these topics:

- “Changing Customer Passwords”
- “Default Naming Conventions” (page 73)
- “Possible Values of Disk and Tape LUNs” (page 75)

Changing Customer Passwords

NonStop BladeSystems are shipped with default user names and default passwords for the Administrator for certain components and software. Once your system is set up, you should change these passwords to your own passwords.

Table 4-1 Default User Names and Passwords

NonStop Blade System Component	Default User Name	Default Password	To change this password, see...
Onboard Administrator (OA)	Admin	hpnonstop	"Change the Onboard Administrator (OA) Password"
CLIM iLO	Admin	hpnonstop	"Change the CLIM iLO Password"
CLIM Maintenance Interface (eth01)	root	hpnonstop	"Change the Maintenance Interface (Eth0) Password"
NonStop Server Blade MP (iLO)	Admin	hpnonstop	"Change the NonStop ServerBlade MP (iLO) Password"
Remote Desktop	Admin	(None)	"Change the Remote Desktop Password"

Change the Onboard Administrator (OA) Password

To change the OA password:

1. Login to the OA. (You can use the **Launch OA URL** action on the processor blade from the OSM Service Connection.)
2. Click the + (plus sign) in front of the Enclosure information on the left.
3. Click the + (plus sign) in front of Users/Authentication.
4. Click Local Users and all users are displayed on the right side.
5. Select Administrator and click Edit.
6. Enter the new password, then confirm it again. Click update user.
7. Keep track of your OA password.
8. Change the password for each OA.

Change the CLIM iLO Password

To change the CLIM iLO password:

1. In OSM, right click on the CLIM and select Actions.
2. In the next screen, in the Available Actions drop-down window, select Invoke iLO and click Perform Action.
3. Select the Administration tab.
4. Select User Administration.
5. Select Admin local user.
6. Select View/Modify.
7. Change the password.
8. Click Save User Information.
9. Keep track of your CLIM iLO password.
10. Change the iLO password for each CLIM.

Change the Maintenance Interface (Eth0) Password

To change the maintenance interface (eth0) password:

1. From the NonStop host system, enter the `climcmd` command for password:

```
>climcmd clim-name, ip-address, or host-name passwd
```

It will ask for password two times. For example:

```
$SYSTEM STARTUP 3> climcmd c1002531 passwd
comForte SSH client version T9999H06_11Feb2008_comForte_SSH_0078
Enter new UNIX password: hpnonstop
Retype new UNIX password: hpnonstop
passwd: password updated successfully
Termination Info: 0
```

2. Change the maintenance interface (eth0) password for each CLIM.

The user name and password for the eth0:0 maintenance provider are the standard NonStop host system ones, for example, `super.super`, and so on. Other than standard procedures for setting up NonStop host system user names and passwords, nothing further is required for the eth0:0 maintenance provider passwords.

Change the NonStop ServerBlade MP (iLO) Password

To change the NonStop Server Blade MP (iLO) password:

1. Login to the ILO (You can use the **Launch iLO URL** action on the processor blade from the OSM Service Connection.)
2. Select the Administration tab.
3. Click **Local Accounts** from the left side window.
4. Select the user on the right-hand side and click the **Add/Edit** button below.
5. In the new page, enter the new password in the Password confirmation fields, and click **Submit**.
6. Keep track of your NonStop ServerBlade MP (iLO) password.
7. Change the password for each NonStop ServerBlade MP.

Change the Remote Desktop Password

You must change the Remote Desktop Administrator's password to enable connections to the NonStop system console. To change the password for the Administrator's account (which you have logged onto):

1. Press the **Ctrl+Alt+Del** keys and the Windows Security dialogue appears.
2. Click **Change Password**.
3. In the Change Password window:
 - a. Enter the old password.
 - b. Enter the new password.
 - c. Click **OK**.

Default Naming Conventions

The NonStop BladeSystem implements default naming conventions in the same manner as Integrity NonStop NS-series systems.

With a few exceptions, default naming conventions are not necessary for the modular resources that make up a NonStop BladeSystem. In most cases, users can name their resources at will and use the appropriate management applications and tools to find the location of the resource.

However, default naming conventions for certain resources simplify creation of the initial configuration files and automatic generation of the names of the modular resources.

Preconfigured default resource names are:

Type of Object	Naming Convention	Example	Description
CLuster I/O Module (CLIM)	<i>Cgroup module slot fiber</i>	C1002532	CLIM that has an X1 attachment point of fiber on the ServerNet switch port located in group 100, module 2, slot 5, port 3, and fiber 2
SAS disk volume	<i>\$SASnumber</i>	\$SAS20	Twentieth SAS disk volume in the system
ESS disk volume	<i>\$ESSnumber</i>	\$ESS20	Twentieth ESS disk drive in the system
Fiber Channel disk drive	<i>\$FCnumber</i>	\$FC10	Tenth Fibre Channel disk drive in the system
Tape drive	<i>\$TAPEnumber</i>	\$TAPE01	First tape drive in the system
Maintenance CIPSAM process	<i>\$ZTCPnumber</i>	\$ZTCP0	First maintenance CIPSAM process for the system
Maintenance provider	<i>ZTCPnumber</i>	ZTCP0	First maintenance provider for the system, associated with the CIPSAM process \$ZTCP0
Maintenance CIPSAM process	<i>\$ZTCPnumber</i>	\$ZTCP1	Second maintenance CIPSAM process for the system
Maintenance provider	<i>ZTCPnumber</i>	ZTCP1	Second maintenance provider for the system, associated with the CIPSAM process \$ZTCP1
IPDATA CIPSAM process	<i>\$ZTC number</i>	\$ZTC0	First IPDATA CIPSAM process for the system
IPDATA provider	<i>\$ZTC number</i>	ZTC0	First IPDATA provider for the system
Maintenance Telserv process	<i>\$ZTNP number</i>	\$ZTNP1	Second maintenance Telserv process for the system that is associated with the CIPSAM \$ZTCP1 process
Non-maintenance Telserv process	<i>\$ZTN number</i>	\$ZTN0	First non-maintenance Telserv process for the system that is associated with the CIPSAM \$ZTC0 process
Listener process	<i>\$ZPRPnumber</i>	\$ZPRP1	Second maintenance Listener process for the system that is associated with the CIPSAM \$ZTC1 process
Non-maintenance Listener process	<i>\$LSN number</i>	\$LSN0	First non-maintenance Listener process for the system that is associated with the CIPSAM \$ZTC0 process

Type of Object	Naming Convention	Example	Description
TFTP process	Automatically created by WANMGR	None	None
WANBOOT process	Automatically created by WANMGR	None	None
SWAN adapter	<i>Snumber</i>	S19	Nineteenth SWAN adapter in the system

Possible Values of Disk and Tape LUNs

The possible values of disk and tape LUN numbers depend on the type of the resource.

- For a SAS disk, the LUN number is calculated as $base\ LUN + offset$.
base LUN is the base LUN number for the SAS enclosure. Its value can be 100, 200, 300, 400, 500, 600, 700, 800, or 900, and should be numbered sequentially for each of the SAS enclosures attached to the same CLIM.
offset is the bay (slot) number of the disk in the SAS enclosure.
- For an ESS disk, the LUN number is calculated as $base\ LUN + offset$.
base LUN is the base LUN number for the ESS port. Its value can be 1000, 1500, 2000, 2500, 3000, 3500, 4000, or 4500, and should be numbered sequentially for each of the ESS ports attached to the same CLIM.
offset is the LUN number of the ESS LUN.
- For a physical Fibre Channel tape, the value of LUN number can be 1, 2, 3, 4, 5, 6, 7, 8, or 9, and should be numbered sequentially for each of the physical tapes attached to the same CLIM.
- For a VTS tape, the LUN number is calculated as $base\ LUN + offset$.
base LUN is the base LUN number for the VTS port. Its value can be 5000, 5010, 5020, 5030, 5040, 5050, 5060, 5070, 5080, or 5090, and should be numbered sequentially for each of the VTS ports attached to the same CLIM.
offset is the LUN number of the VTS LUN.

5 Hardware Configuration in Modular Cabinets

This chapter shows locations of hardware components within the 42U modular cabinet for a NonStop BladeSystem. A number of physical configurations are possible because of the flexibility inherent to the NonStop Multicore Architecture and ServerNet network.



NOTE: Hardware configuration drawings in this chapter represent the physical arrangement of the modular enclosures but do not show PDUs. For information about PDUs, see “Power Distribution Units (PDUs)” (page 42).

Maximum Number of Modular Components

This table shows the maximum number of the modular components installed in a BladeSystem. These values might not reflect the system you are planning and are provided only as an example, not as exact values.

	2-Processors	4-Processors	6-Processors	8-Processors
c7000 enclosure	1	1	1	1
ServerNet switch in c7000 enclosure	2	2	2	2
IOAM enclosure ¹	4	4	4	4
CLIMs ²	24	24	24	24

1 The IOAM maximum requires ServerNet High I/O Switches

2 The CLIM maximum requires ServerNet High I/O Switches

Enclosure Locations in Cabinets

This table provides details about the location of NonStop BladeSystem enclosures and components within a cabinet. The enclosure location refers to the U location on the rack where the lower edge of the enclosure resides, such as the bottom of a system console at 20U.

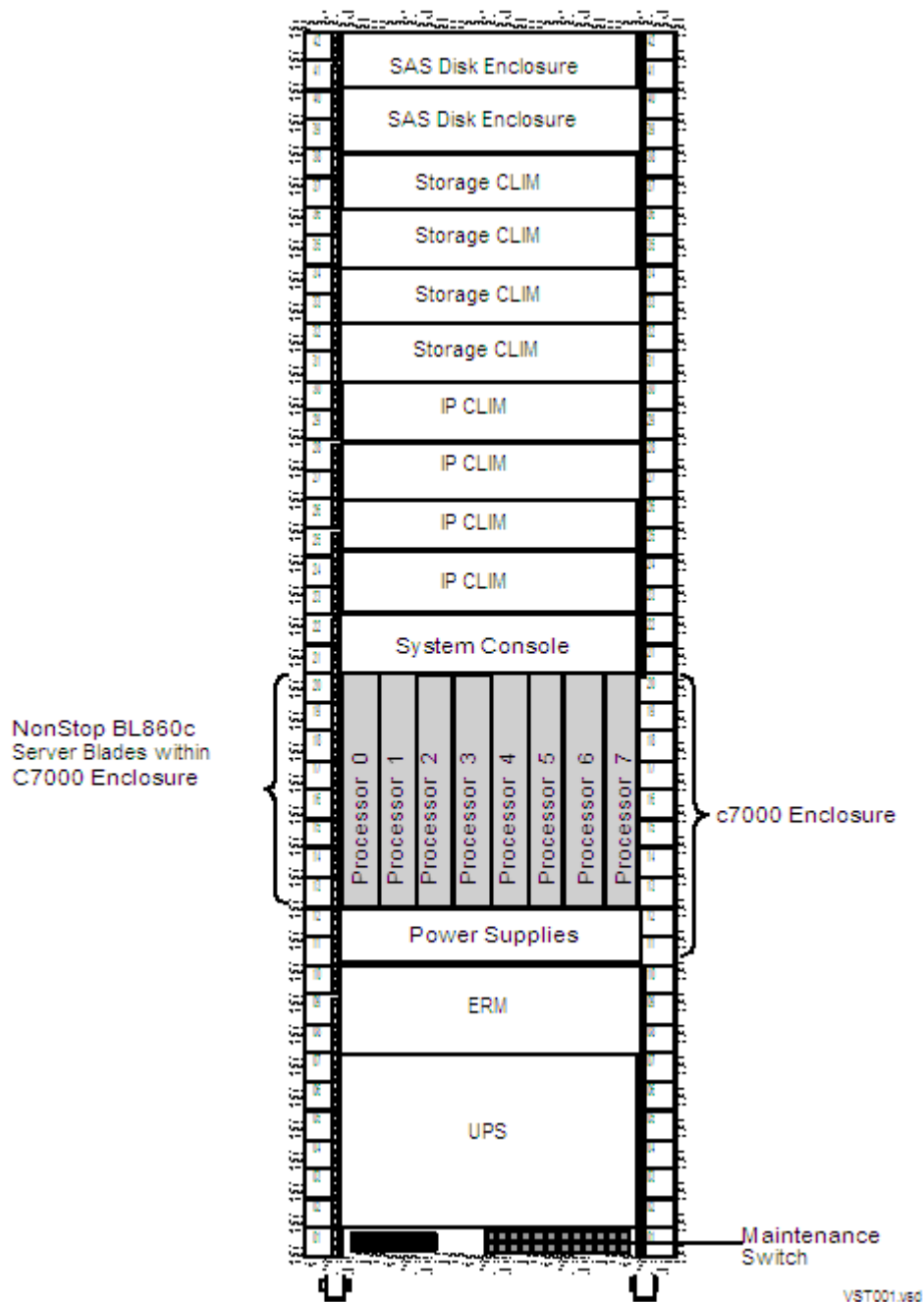
Enclosure or Component	Height (U)	Required Cabinet (Rack) Location	Notes
PDUs	N/A	AC power cord for the PDU exiting out the top rear corner AC power cord for the PDU exiting out the bottom rear corner	For top feed AC (with and without the optional UPS). For bottom feed AC (with and without the optional UPS).
HP R12000/3 UPS	6U	Bottom U of rack	The UPS and any ERMs must be installed in the bottom U of the rack to avoid tipping and stability issues.
Extended runtime module (ERM)	3U	Immediately above UPS (and first ERM if two ERMs installed)	Up to three ERMs can be installed.

Enclosure or Component	Height (U)	Required Cabinet (Rack) Location	Notes
Cabinet stabilizer	N/A	Bottom front exterior of cabinet	Required when you have less than four cabinets bayed together. Cabinet stabilizer is not required when cabinet is bolted to its adjacent cabinet.
c7000 enclosure	10U	<ul style="list-style-type: none"> • Must be installed at U9 when there is no UPS • Must be installed at U11 when there is a UPS and ERM 	There is a limit of one installed c7000 enclosure per cabinet.
IP CLIM	2U	Any available 2U space. Upper U locations are recommended.	IP CLIMs should be adjacent to one another in a group of four, so the CLIMs can share one quad optic port on the c7000 ServerNet switch.
Storage CLIM	2U	Any available 2U space. Upper U locations are recommended.	<ul style="list-style-type: none"> • Storage CLIMs and disk enclosures should be adjacent to one another. • Storage CLIMs should be adjacent to one another in a group of two, so the CLIMs can share one quad optic port on the c7000 ServerNet switch.
SAS disk enclosure	2U	Any available 2U space. Middle or upper U locations are recommended.	disk enclosures and Storage CLIMs should be adjacent to one another.
IOAM enclosure	11U	Any available 11U space. Middle or upper U locations are recommended.	IOAMs and FCDMs should be adjacent to one another.
Fibre Channel disk module (FCDM)	3U	Any available 3U space. Middle or upper U locations are recommended.	IOAMs and FCDMs should be adjacent to one another. Restricted service clearances might exist with a Fibre Channel disk module installed adjacent to the maintenance switch.
System console	2U	U20 is recommended.	Operations and service personnel can use the console best at the middle U locations.
Maintenance switch	1U	Any available 1U space. Top of cabinet is recommended.	

Typical Configuration

Figure 5-1 (page 79) shows the U locations in the 42U modular cabinet of some of the hardware components that can be installed in the modular cabinet.

Figure 5-1 42U Configuration



These options can be installed in locations marked Configurable Space in the configuration drawings:

- Maintenance switch: 1U required, preferably at the top of the cabinet when there is no UPS or the bottom of the cabinet when a UPS is present.
- Console: 2U required, with recommended installation at cabinet offset U20 when there is no UPS or U21 when a UPS is present.
- Fibre Channel disk module: 3U required

A second cabinet is required when:

- A second c7000 enclosure is needed for additional NonStop Server Blades or other components.
- Additional SAS disk enclosures and FCDMs are needed for storage, but space doesn't exist in the cabinet.
- Space for optional components exceeds the capacity of the cabinet.

6 Maintenance and Support Connectivity

Local monitoring and maintenance of the NonStop BladeSystem occurs over the dedicated service LAN. The dedicated service LAN provides connectivity between the system console and the maintenance infrastructure in the system hardware. Remote support is provided by OSM, which runs on the system console and communicates over the HP Instant Support Enterprise Edition infrastructure or an alternative remote access solution.

Only components specified by HP can be connected to the dedicated LAN. No other access to the LAN is permitted.

The dedicated service LAN uses a ProCurve 2524 Ethernet switch for connectivity between the c7000 enclosure, CLIMs, IOAM enclosures, and the system console.

The HP ISEE call-out and call-in access is provided by the hpVPN Cisco 831 router, which connects to the customer internet access. Alternatively, call-out and call-in access is provided by a modem.



NOTE: Your account representative must place a separate order of the ISEE VPN router with the assistance of the ISEE team.

An important part of the system maintenance architecture, the system console is a personal computer (PC) purchased from HP to run maintenance and diagnostic software for NonStop BladeSystems. Through the system console, you can:

- Monitor system health and perform maintenance operations using the HP NonStop Open System Management (OSM) interface
- View manuals and service procedures
- Run HP Tandem Advanced Command Language (TACL) sessions using terminal-emulation software
- Install and manage system software using the Distributed Systems Management/Software Configuration Manager (DSM/SCM)
- Make remote requests to and receive responses from a system using remote operation software

Dedicated Service LAN

A NonStop BladeSystem requires a dedicated LAN for system maintenance through OSM. Only components specified by HP can be connected to a dedicated LAN. No other access to the LAN is permitted.

This subsection includes:

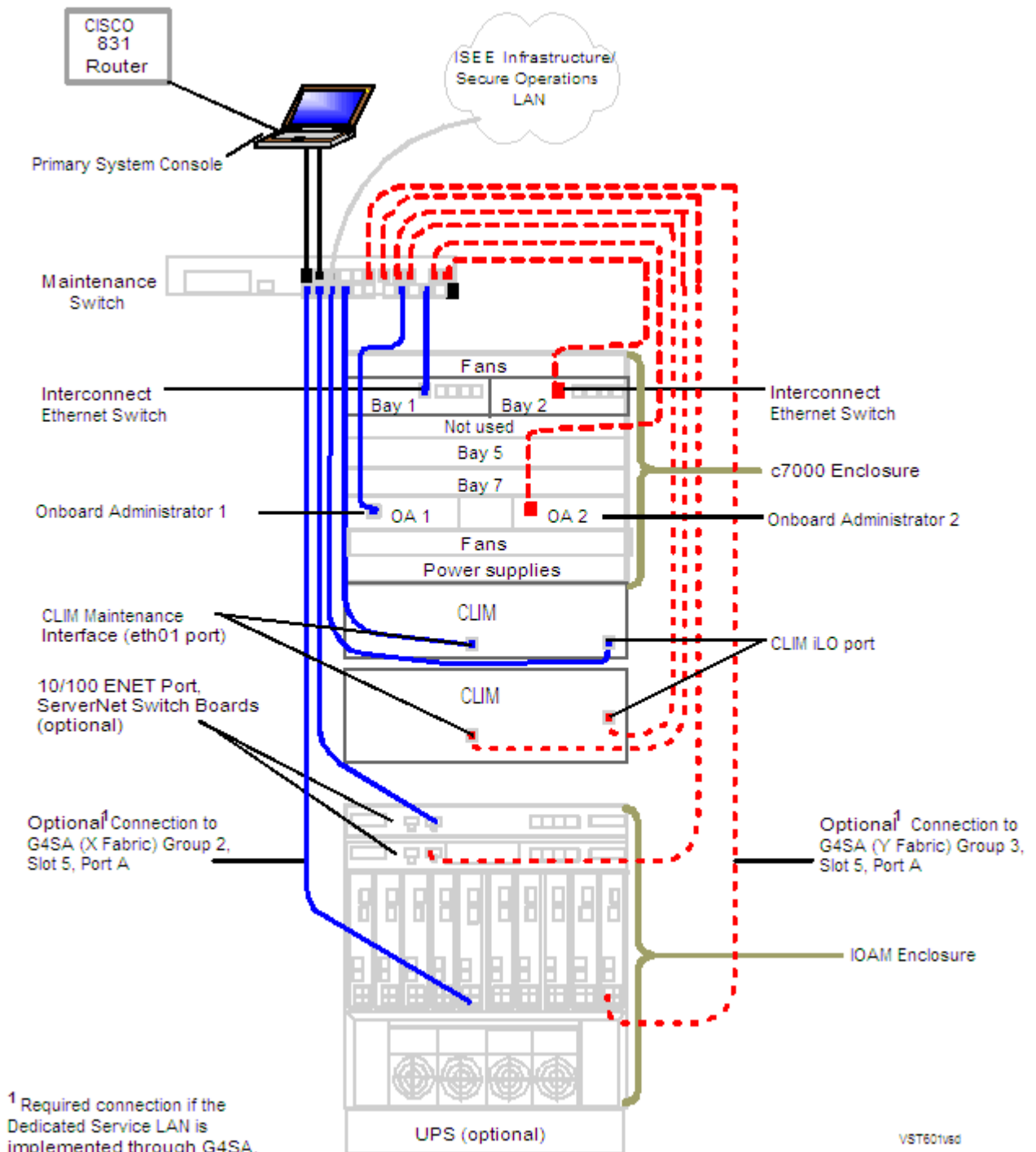
- “Basic LAN Configuration”
- “Fault-Tolerant LAN Configuration ” (page 83)
- “IP Addresses” (page 84)
- “Ethernet Cables” (page 88)
- “SWAN Concentrator Restrictions” (page 88)
- “Dedicated Service LAN Links Using G4SAs” (page 88)
- “Dedicated Service LAN Links Using IP CLIMs” (page 89)
- “Initial Configuration for a Dedicated Service LAN” (page 89)

Basic LAN Configuration

A basic dedicated service LAN that does not provide a fault-tolerant configuration requires connection of these components to the ProCurve 2524 maintenance switch installed in the modular cabinet as shown in example :

- One connection for each system console running OSM
- One connection to each of the two Onboard Administrators (OAs) in each c7000 enclosure
- One connection to each of the two Interconnect Ethernet switches in each c7000 enclosure
- One connection to the maintenance interface (eth0) for each IP and Storage CLIM.
- One connection to the iLO interface for each IP CLIM and Storage CLIM
- One connection to each of the ServerNet switch boards in each IOAM enclosure, and optionally, two connections to two G4SAs in the system (if the NonStop maintenance LAN is implemented using G4SAs)
- UPS (optional) for power-fail monitoring

Figure 6-1 Example of a Basic LAN Configuration With One Maintenance Switch

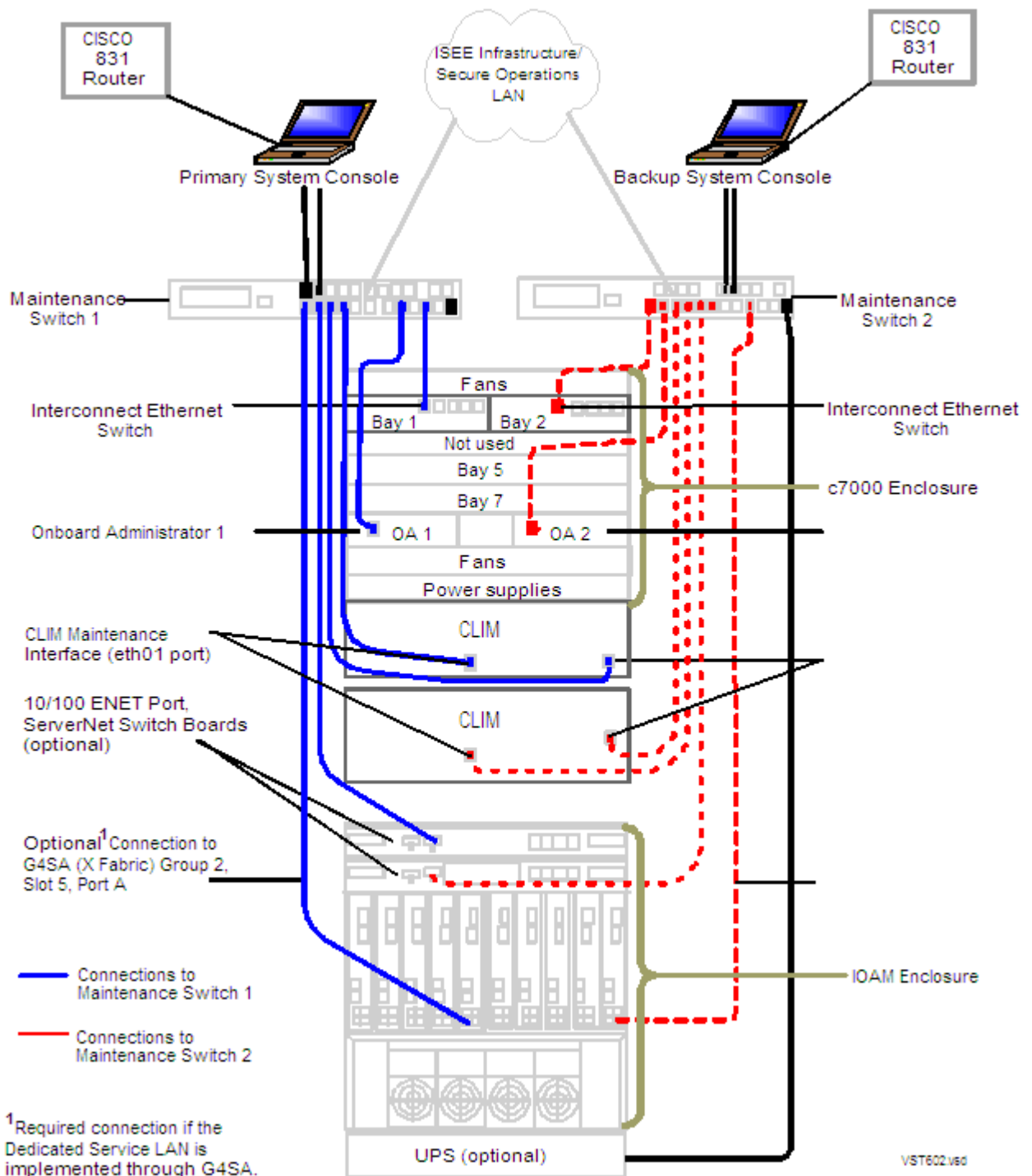


Fault-Tolerant LAN Configuration

HP recommends that you use a fault-tolerant LAN configuration. A fault-tolerant configuration includes these connections to two maintenance switches as shown in example Figure 6-2 (page 84):

- A system console to each maintenance switch
- One connection from one Onboard Administrator (OA) in the c7000 enclosure to one maintenance switch, and another connection from the other Onboard Administrator to the second maintenance switch
- One connection from one Interconnect Ethernet switch in the c7000 enclosure to one maintenance switch, and another connection from the other Interconnect Ethernet switch to the second maintenance switch
- For every CLIM pair, connect the iLO and eth0 ports of the primary CLIM to one maintenance switch, and the iLO and eth0 ports of the backup CLIM to the second maintenance switch
 - For IP CLIMs, the primary and backup CLIMs are defined, based on the CLIM-to-CLIM failover configuration
 - For Storage CLIMs, the primary and backup CLIMs are defined, based on the disk path configuration
- A Storage CLIM to one maintenance switch and another Storage CLIM to the other maintenance switch
- One of the two IOAM enclosure ServerNet switch boards to each maintenance switch (optional)
- If CLIMs are used to configure the maintenance LAN, connect the CLIM that configures \$ZTCP0 to one maintenance switch, and connect the other CLIM that configures \$ZTCP1 to the second maintenance switch
- If G4SAs are used to configure the maintenance LAN, connect the CLIM that configures \$ZTCP0 to one maintenance switch, and connect the other CLIM that configures \$ZTCP1 to the second maintenance switch

Figure 6-2 Example of a Fault-Tolerant LAN Configuration With Two Maintenance Switches



IP Addresses

NonStop BladeSystems require Internet protocol (IP) addresses for these components that are connected to the dedicated service LAN:

- c7000 enclosure ServerNet switches
- IOAM enclosure ServerNet switch boards
- Maintenance switches
- System consoles
- OSM Service Connection
- UPS (optional)



NOTE: Factory-default IP addresses for G4SAs are in the *LAN Configuration and Management Manual*. IP addresses for SWAN concentrators are in the *WAN Subsystem Configuration and Management Manual*.

These components have default IP addresses that are preconfigured at the factory. You can change these preconfigured IP addresses to addresses appropriate for your LAN environment:

Component	Location	Default IP Address
Primary system console (rack-mounted or stand-alone)	N/A	192.168.36.1
Backup system console (rack-mounted only)	N/A	192.168.36.2
Maintenance switch (ProCurve 2524) (First switch)	N/A	192.168.36.21
Maintenance switch (ProCurve 2524) (Second switch)	N/A	192.168.36.22
Onboard Administrators in c7000 enclosure		Assigned by DHCP server on the NonStop system console
CLIM iLOs		Assigned by DHCP server on the NonStop system console
Server Blade iLOs		Assigned through Enclosure Bay IP Addressing (EBIPA)
ServerNet switches in c7000 enclosure (OSM Low-Level Link)		Assigned through Enclosure Bay IP Addressing (EBIPA)
Interconnect Ethernet switches		Assigned through Enclosure Bay IP Addressing (EBIPA)
CLIM Maintenance Interfaces	CLIM at 100.2.5.3.1	192.168.38.31
	CLIM at 100.2.5.3.2	192.168.38.32
	CLIM at 100.2.5.3.3	192.168.38.33
	CLIM at 100.2.5.3.4	192.168.38.34
	CLIM at 100.2.5.4.1	192.168.38.41
	CLIM at 100.2.5.4.2	192.168.38.42
	CLIM at 100.2.5.4.3	192.168.38.43
	CLIM at 100.2.5.4.4	192.168.38.44
	CLIM at 100.2.5.5.1	192.168.38.51
	CLIM at 100.2.5.5.2	192.168.38.52
	CLIM at 100.2.5.5.3	192.168.38.53
	CLIM at 100.2.5.5.4	192.168.38.54
	CLIM at 100.2.5.6.1	192.168.38.61
	CLIM at 100.2.5.6.2	192.168.38.62
	CLIM at 100.2.5.6.3	192.168.38.63
	CLIM at 100.2.5.6.4	192.168.38.64
	CLIM at 100.2.5.7.1	192.168.38.71

Component	Location	Default IP Address
	CLIM at 100.2.5.7.2	192.168.38.72
	CLIM at 100.2.5.7.3	192.168.38.73
	CLIM at 100.2.5.7.4	192.168.38.74
	CLIM at 100.2.5.8.1	192.168.38.81
	CLIM at 100.2.5.8.2	192.168.38.82
	CLIM at 100.2.5.8.3	192.168.38.83
	CLIM at 100.2.5.8.4	192.168.38.84
	CLIM at 101.2.5.3.1	192.168.38.31
	CLIM at 101.2.5.3.2	192.168.38.32
	CLIM at 101.2.5.3.3	192.168.38.33
	CLIM at 101.2.5.3.4	192.168.38.34
	CLIM at 101.2.5.4.1	192.168.38.41
	CLIM at 101.2.5.4.2	192.168.38.42
	CLIM at 101.2.5.4.3	192.168.38.43
	CLIM at 101.2.5.4.4	192.168.38.44
	CLIM at 101.2.5.5.1	192.168.38.51
	CLIM at 101.2.5.5.2	192.168.38.52
	CLIM at 101.2.5.5.3	192.168.38.53
	CLIM at 101.2.5.5.4	192.168.38.54
	CLIM at 101.2.5.6.1	192.168.38.61
	CLIM at 101.2.5.6.2	192.168.38.62
	CLIM at 101.2.5.6.3	192.168.38.63
	CLIM at 101.2.5.6.4	192.168.38.64
	CLIM at 101.2.5.7.1	192.168.38.71
	CLIM at 101.2.5.7.2	192.168.38.72
	CLIM at 101.2.5.7.3	192.168.38.73
	CLIM at 101.2.5.7.4	192.168.38.74
	CLIM at 101.2.5.8.1	192.168.38.81
	CLIM at 101.2.5.8.2	192.168.38.82
	CLIM at 101.2.5.8.3	192.168.38.83
	CLIM at 101.2.5.8.4	192.168.38.84

Component	Location	Default IP Address
IOAM enclosure (ServerNet switch boards)	110.2.14	192.168.36.222
	110.3.14	192.168.36.223
	111.2.14	192.168.36.224
	111.3.14	192.168.36.225
	112.2.14	192.168.36.226
	112.3.14	192.168.36.227
	113.2.14	192.168.36.228
	113.3.14	192.168.36.229
	114.2.14	192.168.36.230
	114.3.14	192.168.36.231
	115.2.14	192.168.36.232
	115.3.14	192.168.36.233
UPS (rack-mounted only)	Rack 01	192.168.36.31
	Rack 02	192.168.36.32
	Rack 03	192.168.36.33
	Rack 04	192.168.36.34
	Rack 05	192.168.36.35
	Rack 06	192.168.36.36
	Rack 07	192.168.36.37
	Rack 08	192.168.36.38
Onboard Administrator EBIPA settings:	First enclosure device bay subnet mask	255.255.0.0
	First enclosure device bay IP addresses	192.168.36.40 through 192.168.36.55
	First enclosure interconnect bay subnet mask	255.255.0.0
	First enclosure interconnect bay IP addresses	192.168.36.60 through 192.168.36.67
	Second enclosure device bay subnet mask	255.255.0.0
	Second enclosure device bay IP addresses	192.168.36.70 through 192.168.36.85
	Second enclosure interconnect bay subnet mask	255.255.0.0
	Second enclosure interconnect bay IP addresses	192.168.36.90 through 192.168.36.97
NonStop system console DHCP server settings:	Primary system console starting IP address	192.168.31.1
	Primary system console ending IP address	192.168.31.254
	Primary system console subnet mask	255.255.0.0

Component	Location	Default IP Address
	Backup system console starting IP address	192.168.32.1
	Backup system console ending IP address	192.168.32.254
	Backup system console subnet mask	255.255.0.0
TCP/IP processes for OSM Service Connection:		
\$ZTCP0		192.168.36.10 255.255.0.0 subnet mask
\$ZTCP1		192.168.36.11 255.255.0.0 subnet mask

Ethernet Cables

Ethernet connections for a dedicated service LAN require Category 5 unshielded twisted-pair (UTP) cables. For supported cables, see Appendix A (page 93).

SWAN Concentrator Restrictions

- Isolate any ServerNet wide area networks (SWANs) on the system. The system must be equipped with at least two LANs: one LAN for SWAN concentrators and one for the dedicated service LAN.
- Most SWAN concentrators are configured redundantly using two or more subnets. Those subnets also must be isolated from the dedicated service LAN.
- Do not connect SWANs on a subnet containing a DHCP.

Dedicated Service LAN Links Using G4SAs

You can implement system-up service LAN connectivity using G4SAs or IP CLIMs. The values in this table show the identification for G4SAs in slot 5 of both modules of an IOAM enclosure and connected to the maintenance switch:

GMS for G4SA Location in IOAME	G4SA PIF	G4SA PIF	TCP/IP Stack	IP Configuration
110.2.5	G11025.0.A	L1102R	\$ZTCP0	IP: 192.168.36.10 Subnet: %hFFFF0000 Hostname: osmlanx
110.3.5	G11035.0.A	L1103R	\$ZTCP1	IP: 192.168.36.11 Subnet: %hFFFF0000 Hostname: osmlany



NOTE: For a fault-tolerant dedicated service LAN, two G4SAs are required, with each G4SA connected to a separate maintenance switch. These G4SA can reside in modules 2 and 3 of the same IOAM enclosure or in module 2 of one IOAM enclosure and module 3 of a second IOAM enclosure. When the G4SA provides connection to the dedicated service LAN, use the slower 10/100 Mbps PIF A rather than one of the high-speed 1000 Mbps Ethernet ports of PIF C or D.

Dedicated Service LAN Links Using IP CLIMs

You can implement up-system service LAN connectivity using IP CLIMs, if the system has at least two IP CLIMs. The values in this table show the identification for the CLIMs in a NonStop BladeSystem and connected to the maintenance switch. In this table, a CLIM named C1002581 is connected to the first fiber and eighth port of the ServerNet switch in Group 100, module 2, interconnect bay 5 of a c7000 enclosure:

CLIM Location	TCP/IP Stack	IP Configuration
100.2.5.8.1	\$ZTCP0	IP: 192.168.36.10 Subnet: %hFFFF0000 Hostname: osmlanx
100.2.5.8.2	\$ZTCP1	IP: 192.168.36.11 Subnet: %hFFFF0000 Hostname: osmlany



NOTE: For a fault-tolerant dedicated service LAN, two IP CLIMs are required, with each IP CLIM connected to a separate maintenance switch.

Initial Configuration for a Dedicated Service LAN

New systems are shipped with an initial set of IP addresses configured. For a listing of these initial IP addresses, see “IP Addresses” (page 84).

Factory-default IP addresses for the G4SAs are in the *LAN Configuration and Management Manual*. IP addresses for SWAN concentrators are in the *WAN Subsystem Configuration and Management Manual*.

HP recommends that you change these preconfigured IP addresses to addresses appropriate for your LAN environment. You must change the preconfigured IP addresses on:

- A backup system console if you want to connect it to a dedicated service LAN that already includes a primary system console or other system console
- Any system console if you want to connect it to a dedicated service LAN that already includes a primary system console

Keep track of all the IP addresses in your system so that no IP address is assigned twice.

System Consoles

New system consoles are preconfigured with the required HP and third-party software. When upgrading to the latest RVU, you can install software upgrades from the HP NonStop System Console Installer DVD image.

Some system console hardware, including the PC system unit, monitor, and keyboard, can be mounted in the cabinet. Other PCs are installed outside the cabinet and require separate provisions or furniture to hold the PC hardware.

System consoles communicate with NonStop BladeSystems over a dedicated service local area network (LAN) or a secure operations LAN. A dedicated service LAN is required for use of OSM Low-Level Link and Notification Director functionality, which includes configuring primary and backup dial-out points (referred to as the primary and backup system consoles, respectively). HP recommends that you also configure the backup dedicated service LAN with a backup system console.

System Console Configurations

Several system console configurations are possible:

- “One System Console Managing One System (Setup Configuration)”
- “Primary and Backup System Consoles Managing One System”
- “Multiple System Consoles Managing One System” (page 91)
- “Managing Multiple Systems Using One or Two System Consoles” (page 91)
- “Cascading Ethernet Switch or Hub Configuration” (page 91)

One System Console Managing One System (Setup Configuration)

The one system console on the LAN must be configured as the primary system console. This configuration can be called the setup configuration and is used during initial setup and installation of the system console and the server.

The setup configuration is an example of a secure, stand-alone network as shown in Figure 6-1 (page 82). A LAN cable connects the primary system console to the maintenance switch, and additional LAN cables connect the switches and Ethernet ports. The maintenance switch or an optional second maintenance switch allows you to later add a backup system console and additional system consoles.



NOTE: Because the system console and maintenance switch are single points of failure that could disrupt access to OSM, this configuration is not recommended for operations that require high availability or fault tolerance.

When you use this configuration, you do not need to change the preconfigured IP addresses.

Primary and Backup System Consoles Managing One System

This configuration is recommended. It is similar to the setup configuration, but for fault-tolerant redundancy, it includes a second maintenance switch, backup system console, and second modem (if a modem-based remote solution is used). The maintenance switches provide a dedicated LAN in which all systems use the same subnet. Figure 6-2 (page 84) shows a fault-tolerant configuration without modems.



NOTE: A subnet is a network division within the TCP/IP model. Within a given network, each subnet is treated as a separate network. Outside that network, the subnets appear as part of a single network. The terms *subnet* and *subnetwork* are used interchangeably.

If a remote maintenance LAN connection is required, use the second network interface card (NIC) in the NonStop system console to connect to the operations LAN, and access the other devices in the maintenance LAN using Remote Desktop via the console.

Because this configuration uses only one subnet, you must:

- Enable Spanning Tree Protocol (STP) in switches or routers that are part of the operations LAN.



NOTE: Do not perform the next two bulleted items if your backup system console is shipped with a new NonStop BladeSystem. In this case, HP has already configured these items for you.

- Change the preconfigured DHCP configuration of the backup system console before you add it to the LAN.
 - Change the preconfigured IP address of the backup system console before you add it to the LAN.
-



CAUTION: Networks with more than one path between any two systems can cause loops that result in message duplication and broadcast storms that can bring down the network. If a second connection is used, refer to the documentation for the ProCurve 2524 maintenance switch and enable STP in the maintenance switches. STP ensures only one active path at any given moment between two systems on the network. In networks with two or more physical paths between two systems, STP ensures only one active path between them and blocks all other redundant paths.

Multiple System Consoles Managing One System

Two maintenance switches provide fault tolerance and extra ports for adding system consoles. You must change the preconfigured IP addresses of the second and subsequent system consoles before you can add them to the LAN. Only two system consoles should run the DHCP, DNS, BOOTP, FTP, and TFTP servers. These services should not be running on other consoles in the same maintenance LAN.

Managing Multiple Systems Using One or Two System Consoles

If you want to manage more than one system from a console (or from a fault-tolerant pair of consoles), you can daisy chain the maintenance switches together. This configuration requires an IP address scheme to support it. Contact your HP service provider to design this configuration.

Cascading Ethernet Switch or Hub Configuration

Additional Ethernet switches or hubs can be connected (**cascaded**) to the maintenance switches already installed. Primary and backup system consoles and the server must be on the same subnet.

You must change the preconfigured IP addresses of the second and subsequent system consoles before you can add them to the LAN.

A Cables

Cable Types, Connectors, Lengths, and Product IDs

Available cables and their lengths are:

Cable Type	Connectors	Length (meters)	Length (feet)	Product ID
MMF	LC-LC	.24	.79	N.A.
MMF	MTP-LC	2.5	8	M8941-02
		10	33	M8941-10
		15	49	M8941-15
		30	98	M8941-30
		50	164	M8941-50
MMF	MTP-MTP	1.5	5	M8925-01
		5	16	M8925-05
		10	33	M8925-10
		30	98	M8925-30
		50	164	M8925-50
		100	328	M8925-100
SAS to mini SAS cables	SFF-8470 to SFF-8088	1	3	M8905-01
		2	7	M8905-02
		4	13	M8905-04
		6	20	M8905-06
SAS to SAS cables	SFF-8088 to SFF-8088	2	7	M8906-02
		4	13	M8906-04
		6	49	M8906-06
CAT-5 Ethernet	RJ-45	1.5	5	M8926-05
		3	10	M8926-10
		4.6	15	M8926-15
		7.7	25	M8926-25



NOTE: ServerNet cluster connections on NonStop BladeSystems follow the ServerNet cluster and cable length rules and restrictions. For more information, see these manuals:

- *ServerNet Cluster Supplement for NonStop BladeSystems*
- For 6770 switches and star topologies: *ServerNet Cluster Manual*
- For 6780 switches and layered topology: *ServerNet Cluster 6780 Planning and Installation Guide*

Cable Length Restrictions

Maximum allowable lengths of cables connecting the modular system components are:

Connection	Fiber Type	Connectors	Maximum Length	Product ID
From c7000 enclosure to c7000 enclosure (interconnection)	MTP	MTP-MTP	100 m	M8925nn
From c7000 ServerNet switch to c7000 ServerNet switch (cross-link connection)	MMF	LC-LC	.24 m	N.A.
From c7000 enclosure to CLIM	MTP	MTP-LC	50 m	M8941nn
From Storage CLIM SAS HBA port to SAS disk enclosure	MMF	SFF-8470 to SFF-8088	6 m	M8905nn
From Storage CLIM SAS HBA port to SAS tape	MMF	SFF-8470 to SFF-8088	6 m	M8905nn
From SAS disk enclosure to SAS disk enclosure	N.A.	SFF-8088 to SFF-8088	6 m	M8906nn
From Storage CLIM FC port to ESS	MMF	LC-LC	250 m	M8900nn
Storage CLIM FC port to FC tape	MMF	LC-LC	250 m	M8900nn

Although a considerable distance can exist between the modular enclosures in the system, HP recommends placing all cabinets adjacent to each other and bolting them together, with cable length between each of the enclosures as short as possible.

B Operations and Management Using OSM Applications

OSM client-based components are installed on new system console shipments and also delivered by an OSM installer on the HP NonStop System Console (NSC) Installer DVD image. The NSC DVD image also delivers all other client software required for managing and servicing NonStop servers. For installation instructions, see the *NonStop System Console Installer Guide*.

OSM server-based components are incorporated in a single OSM server-based SPR, T0682 (OSM Service Connection Suite), that is installed on NonStop BladeSystems running the HP NonStop operating system.

For information on how to install, configure and start OSM server-based processes and components, see the *OSM Migration and Configuration Guide*. The OSM components are:

Product ID	Component	Task Performed
T0632	OSM Notification Director	Dial-in and dial-out services
T0633	OSM Low-Level Link	<ul style="list-style-type: none">• Provides down-system support• Provides support to configure IP CLIMs and Storage CLIMs before they are operational in a NonStop BladeSystem• Provides IP CLIM and Storage CLIM software updates
T0634	OSM Console Tools	Provides Start menu shortcuts and default home pages for easy access to the OSM Service Connection and OSM Event Viewer (browser-based OSM applications that are not installed on the system console)
	OSM Certificate Tool	Establishes certificate-based trust between the OSM server and the Onboard Administrators in a c7000 enclosure
	OSM System Inventory Tool	Retrieves hardware inventory from multiple NonStop BladeSystems
	Terminal Emulator File Converter	Converts existing OSM Service Connection-related OutsideView (.cps) session files to MR-WIN6530 (.653) session files

System-Down OSM Low-Level Link

In NonStop BladeSystems, the maintenance entity (ME) in the c7000 ServerNet switch or IOAM enclosures provides dedicated service LAN services via the OSM Low-Level Link for both OS coldload, system management, and hardware configuration when hardware is powered up but the OS is not running.

AC Power Monitoring

NonStop BladeSystems require one of the following to support system operation through power transients or an orderly shutdown of I/O operations and processors during a power failure:

- The optional, HP-supported model R12000/3 UPS (with one to four ERMs for additional battery power)
- A user-supplied UPS installed in each modular cabinet
- A user-supplied site UPS

If the HP R12000/3 UPS is installed, it is connected to the system's dedicated service LAN via the maintenance switch where OSM monitors the power state of either AC `on` or AC `off`.

For OSM to provide AC power fail support, an HP R12000/3 UPS must be installed, connected to the system's dedicated service LAN via the maintenance switch and configured as described in the *NonStop BladeSystems Hardware Installation Manual*.

Then, you must perform these actions in the OSM Service Connection:

- **Configure a Power Source as AC**, located under Enclosure 100, to configure the power rail (either A or B) connected to AC power.
- **Configure a Power Source as UPS**, located under Enclosure 100, to configure the power rail (either A or B) connected to the UPS. While performing this action, you must enter the IP address of the UPS.
- (Optional/recommended) **Verify Power Fail Configuration**, located under the system object, to verify that power fail support has been properly configured and is in place for the NonStop BladeSystem.

If a power outage occurs, OSM starts a ride-through timer and outputs an EMS notification that the system is running on the UPS batteries. The ride-through timer can be used to let the system continue operation for a short period in case the power outage was only a momentary transient. The ERMs installed in each cabinet can extend the battery-supported system runtime.

The system user must use SCF to configure the system ride-through time to execute an orderly shutdown before the UPS batteries are depleted. The time available for battery support depends on the charge in the batteries and the power that the system draws.

Additionally, if the site's air conditioning shuts down in a power failure, the system should be shut down before its internal air temperatures can rise to the point that initiates a thermal shutdown. A timely and orderly shutdown prevents an uncontrolled and asymmetric shutdown of the system resources from depleted UPS batteries or thermal shutdown.

If a user-supplied rack-mounted UPS or a site UPS is used rather than the HP-supported model R12000/3 UPS, the system is not notified of the power outage. The user is responsible for detecting power transients and outages and developing the appropriate actions, which might include a ride-through time based on the capacity of the site UPS and the power demands made on that UPS.

The R12000/3 UPS and ERM installed in modular cabinets do not support any devices that are external to the cabinets. External devices can include tape drives, external disk drives, LAN routers, and SWAN concentrators. Any external peripheral devices that do not have UPS support will fail immediately at the onset of a power failure. Plan for UPS support of any external peripheral devices that must remain operational as system resources. This support can come from a site UPS or individual units as necessary.

This information relates to handling power failures:

- For ride-through time, see the *SCF Reference Manual for the Kernel Subsystem*.
- For the TACL SETTIME command, see the *TACL Reference Manual*.
- To set system time programmatically, see the *Guardian Procedure Calls Reference Manual*.

AC Power-Fail States

These states occur when a power failure occurs and an optional HP model R12000/3 UPS is installed in each cabinet within the system:

System State	Description
NSK_RUNNING	NonStop operating system is running normally.
RIDE_THRU	OSM has detected a power failure and begins timing the outage. AC power returning terminates RIDE_THRU and puts the operating system back into an NSK_RUNNING state. At the end of the predetermined RIDE_THRU time, if AC has not returned, OSM executes a PFAIL_SHOUT and initiates an orderly shutdown of I/O operations and resources.
HALTED	Normal halt condition. Halted processors do not participate in power-fail handling. A normal power-on also puts the processors into the HALTED state.
POWER_OFF	Loss of optic power from the NonStop Server Blade occurs, or the UPS batteries supplying the server blade are completely depleted. When power returns, the system is essentially in a cold-boot condition.

C Default Startup Characteristics

Each NonStop BladeSystem ships with these default startup characteristics:

- \$SYSTEM disks residing in either SAS disk enclosures or FCDM enclosures:

SAS Disk Enclosures

- Systems with only two to three Storage CLIMs and two SAS disk enclosures with the disks in these locations:

Path	Group	CLIM X1 Location		SAS Disk Enclosure	
		Module	Slot	Enclosure	Bay
Primary	100	2	5	1	1
Backup	100	2	5	3	3
Mirror	100	2	5	3	3
Mirror-Backup	100	2	5	2	1

- Systems with at least four Storage CLIMs and two SAS disk enclosures with the disks in these locations:

Path	Group	CLIM X1 Location		SAS Disk Enclosure	
		Module	Slot	Enclosure	Bay
Primary	100	2	5	1	1
Backup	100	2	5	1	1
Mirror	100	2	5	4	3
Mirror-Backup	100	2	5	3	3

FCDM Enclosures

- Systems with one IOAM enclosure, two FCDMs, and two FCSAs with the disks in these locations:

Path	IOAM		FCSA		Fibre Channel Disk Module	
	Group	Module	Slot	SAC	Shelf	Bay
Primary	110	2	1	1	1	1
Backup	110	3	1	1	1	1
Mirror	110	3	1	2	1	1
Mirror-Backup	110	2	1	2	1	1

- Systems with two IOAM enclosures, two FCDMs, and two FCSAs with the disks in these locations:

Path	IOAM		FCSA		Fibre Channel Disk Module	
	Group	Module	Slot	SAC	Shelf	Bay
Primary	110	2	1	1	1	1

Backup	111	2	1	1	1	1
Mirror	111	2	1	2	1	1
Mirror-Backup	110	2	1	2	1	1

- Systems with one IOAM enclosure, two FCDMs, and four FCSAs with the disks in these locations:

	IOAM		FCSA		Fibre Channel Disk Module	
Path	Group	Module	Slot	SAC	Shelf	Bay
Primary	110	2	1	1	1	1
Backup	110	3	1	1	1	1
Mirror	110	3	2	2	1	1
Mirror-Backup	110	2	2	2	1	1

- Systems with two IOAM enclosures, two FCDMs, and four FCSAs with the disks in these locations:

	IOAM		FCSA		Fibre Channel Disk Module	
Path	Group	Module	Slot	SAC	Shelf	Bay
Primary	110	2	1	1	1	1
Backup	111	2	1	1	1	1
Mirror	111	3	1	2	1	1
Mirror-Backup	110	3	1	2	1	1

- Configured system load paths
- Enabled command interpreter input (CIIN) function

If the automatic system load is not successful, additional paths for loading are available in the boot task. Using one load path, the system load task attempts to use another path and keeps trying until all possible paths have been used or the system load is successful. These 16 paths are available for loading and are listed in the order of their use by the system load task:

Load Path	Description	Source Disk	Destination Processor	ServerNet Fabric
1	Primary	\$SYSTEM-P	0	X
2	Primary	\$SYSTEM-P	0	Y
3	Backup	\$SYSTEM-P	0	X
4	Backup	\$SYSTEM-P	0	Y
5	Mirror	\$SYSTEM-M	0	X
6	Mirror	\$SYSTEM-M	0	Y
7	Mirror-Backup	\$SYSTEM-M	0	X
8	Mirror-Backup	\$SYSTEM-M	0	Y
9	Primary	\$SYSTEM-P	1	X
10	Primary	\$SYSTEM-P	1	Y

Load Path	Description	Source Disk	Destination Processor	ServerNet Fabric
11	Backup	\$SYSTEM-P	1	X
12	Backup	\$SYSTEM-P	1	Y
13	Mirror	\$SYSTEM-M	1	X
14	Mirror	\$SYSTEM-M	1	Y
15	Mirror-Backup	\$SYSTEM-M	1	X
16	Mirror-Backup	\$SYSTEM-M	1	Y

The command interpreter input file (CIIN) is automatically invoked after the first processor is loaded. The CIIN file shipped with new systems contains the TACL RELOAD * command, which loads the remaining processors.

For default configurations of the Fibre Channel ports, Fibre Channel disk modules, and load disks, see “Example Configurations of the IOAM Enclosure and Fibre Channel Disk Module” (page 63). For default configurations of the HBA SAS ports, SAS disk enclosures, and load disks, see “Configurations for Storage CLIM and SAS Disk Enclosures” (page 58).

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